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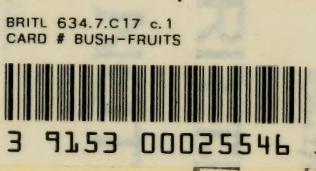

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BUSH-FRUITS

A HORTICULTURAL MONOGRAPH OF
RASPBERRIES, BLACKBERRIES, DEWBERRIES, CURRANTS
GOOSEBERRIES, AND
OTHER SHRUB-LIKE FRUITS

BY

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PREFACE BY THE EDITOR

In a proposed series of monographs on the various types of American fruits, this book is the first. Its purpose is to present both the practical and technical phases of all the important questions concerned in the cultivation and domestication of the fruits under discussion. It has been the effort to separate these two classes of matter, so that the grower may go direct to his subject without being distracted by details of history, botany or entomology; and the student and investigator may be equally at ease in rapid reference to the subjects in which he is primarily interested. A historical sketch is of the greatest value as information and in giving the reader a perspective of the subject, but it is of no direct importance to the cultivation of a crop, and, therefore, should not form an introduction to the practical matter, nor be incorporated with it, notwithstanding the fact that such amalgamation is the custom. The practical matters in this book aim to begin where the cultivator must begin,—with the land and the plant.

In this, as in other volumes of the series of

which it is a part, the aim has been to treat general truths and principles, rather than mere details of practice. A book cannot instruct in all the details of any rural business, because these details vary with the environment and the personality of the operator. The book should attempt, therefore, to give such instruction as to enable the reader to think out and to solve the local problems for himself. When practices are described in detail, it is rather more for the purpose of illustrating a principle than for the giving of direct advice.

In this book an effort has been made to discuss all those small-fruits which have many or most points in common. Therefore, the strawberry and cranberry have been omitted, and the term bush-fruits, long in use in England, is employed to designate the group. The use of this term will go far towards elucidating the principles involved in the cultivation of the fruits here described, by eliminating unrelated topics; for the principles which underlie the management of the strawberry are no more like the principles underlying the management of the blackberry than they are like those concerned in the growing of the apple.

The domestication of the bush-fruits is one of the most recent developments of American horticulture, and the subject is all the more interesting

because all the important types, excepting the currant, are evolutions from the species of our own woods. Since the enterprise is so new, the reader must not expect the advice which is given for the management of the bush-fruit plantation to be as permanent and final as that which might be given for apples or pears.

It only remains to say that this book is an extension of a thesis presented to the Cornell University for the degree of Master of Science in Agriculture, and to add that the author was a bush-fruit grower before he was a university student and a teacher.

L. H. BAILEY.

CORNELL UNIVERSITY, ITHACA, N. Y.,
Sept. 30. 1898,

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BUSH-FRUITS

BUSH-FRUITS

Part I

GENERAL CONSIDERATIONS

CHAPTER I

INTRODUCTORY DISCUSSION

Who does not love the garden! It has delights for all, whether merchant or farmer, matron or maiden. No garden is complete without bush-fruits. Most readers who may consult this book are doubtless already interested in their cultivation, and do not need to be told of their merits. Yet there are farmers, even, who say that it is cheaper to buy fruit for the family than to grow it. Let no one commit this error. It means that far less will be used than ought to be used. Fruit is too easily and cheaply grown on the farm ever to be neglected. It will add much to the attractiveness of the place, promote the health of its occupants and increase their loyalty and love for the home. The berries of the hedge-row and wood-lot are disappearing; time is better spent elsewhere than in hunting for the few that remain. Such fruit costs too much; it is purchased with something more valuable than current coin.

Contact with nature affords a better tonic and nervine than the pharmacist can compound. A vacation in the country brings rest and recuperation to the business and professional man, but not every one can take it. If he be so fortunate as to possess a garden it may afford him a vacation for an hour at any time. In such a garden bush-fruits may reach their highest perfection. Every plant and flower becomes a companion and a friend. Flowers then acquire a tint and perfume and fruits a flavor and piquancy which no others can equal.

To grow bush-fruits for home use is nearly always wise. To grow them for market may not be. Many things must be considered, chief of which are the facilities for gathering and marketing. To grow berries where pickers are not easily had is a hazardous undertaking. Even when help seems abundant it may prove insufficient. Few people who have not tried it know what it means to pick berries all day under a scorching July sun. To do it demands much perseverance, especially among those who are unaccustomed to outdoor work.

A near-by market is always preferable, for most berries suffer from shipment, though gooseberries are an exception. The growing of raspberries for evaporating is open to the farmer, independent of the proximity to pickers and markets. The farmer should also study himself before embarking in the commercial growing of bush-fruits. Not all men are adapted to the business. A mistake in the man is more serious than a mistake in the location or the soil.

THE SITE*

The site or slope of the land may greatly affect the success of a crop. Most bush-fruits thrive best in mountainous or hilly regions and prefer a cool northern exposure, though this is not imperative. The heat of summer is more detrimental than the cold of winter, except on the northern limit of their range. Drought is the great enemy to be avoided, and a location which will in any way help to counteract its effects should be sought. This is of paramount importance in the Southern states and semi-arid regions of the West. In many parts of these regions bush-fruits do not thrive in field culture. Blackberries succeed better in the far South than raspberries, while red raspberries endure better than blacks. Neither currants nor gooseberries succeed. On the Plains black-caps thrive better than either reds or blackberries. Good results may also be obtained from currants and gooseberries under favorable conditions. Propagation of black-caps is more difficult in the Gulf states than at the North and can be successfully done only in partial shade.

Most bush-fruits can be grown where partially shaded by trees, though this is seldom the best place to grow them. The danger from spring frosts is an important consideration in the choice of a site. Air-drainage is as important as soil-drainage. High land

*In the following discussions of the care and treatment of the bush-fruit plantation only general and summary statements can be made. For more thorough consideration of some of these subjects the reader is referred to Bailey's "Principles of Fruit-Growing."

often escapes frosts when lower land suffers, and is therefore preferable, so far as this influence is concerned. On the other hand the soil of valleys often retains moisture better than that of hills; moisture being imperative, the valley lands are preferable in this regard. In parts of the country this difference does not hold, the soil of the valleys being lighter than that of the uplands. Wind-breaks are of importance in parts of the country subject to hot, drying winds during the summer. This is particularly true on the Plains; the wind velocity is often high, the humidity low and the temperature great. This combination taxes the powers of the plant to its utmost. A wind-break at the south and west greatly modifies the conditions and reduces the subsequent evaporation, both from soil and plants.

THE LAND

Bush-fruits are not imperious in their soil-demands. Land which will produce good corn or potatoes will produce bush-fruits. It must not be wet and heavy and must not carry standing water during any part of the year, yet it must possess drought-resisting qualities. The keynote of success with these fruits is in being able to supply moisture when the fruit is growing and ripening. Irrigation may be employed with advantage where conditions admit, but is often impracticable. Whatever can be done, therefore, to secure the same results should be done. First of all the land should be deep and have good texture. If not naturally so it can be improved by underdraining, or to some extent by sub-

soiling. It should contain an abundance of decaying vegetable matter. Humus is the great reservoir of moisture. A soil rich in humus not only admits water more freely, but retains more of it and gives it up more slowly. Humus possesses other qualities of advantage in preventing the loss of nitrogen and in setting free mineral constituents of the soil. It can be obtained by the addition of stable-manure or the plowing in of green-crops, but the process must be gradual. To apply large quantities of undecayed vegetable matter at one time may injure rather than improve the condition.

Moist, sandy and clay loams give most universal satisfaction. The dewberry will thrive on a light sandy soil, followed in turn by the red raspberry and blackberry, while a strong clay loam is preferable for the currant and gooseberry. The stronger soils are better adapted to varieties of moderate growth, the lighter soils to the more rampant growers.

Sod land should be avoided, even though in excellent general condition. The sod renders it inconvenient to furrow and plant and may cause the death of many plants. Grass may also become established in the rows and give trouble. Thorough soil-preparation is imperative; no amount of after care can atone for neglect in this. Land which has been thoroughly worked for one or two seasons previous to planting is to be preferred.

In parts of the West where droughts are often severe and where the substratum of the soil is hard and impervious, subsoiling will often prove advantageous. It should be done the fall before planting, or even

earlier, in order that the loosened subsoil may become saturated with moisture and somewhat compacted. Plantings immediately following spring subsoiling may suffer more from drought than those on unsubsoiled land, because the recently loosened soil dries out more rapidly. For the same reason fall plowing is to be preferred in those parts of the country. It is essential that the soil at planting time shall be moist, pliable, thoroughly and deeply pulverized, so that the roots may quickly establish themselves. Soil which is uniformly fertile by previous culture and manuring is much preferable to one which has been neglected and heavily fertilized at planting time. Acidity of soil is less deleterious with bush-fruits than with many other crops. Blackberries and black raspberries appear to thrive as well in acid soils as in others. Red raspberries, currants, and gooseberries are somewhat benefited by liming if the soil is very acid.

FERTILIZERS

Bush-fruits do not demand heavy fertilizing. Instances are common where land which has failed to yield good returns in farm crops has given good yields of bush-fruits without fertilizers of any kind. It does not follow that it is best to neglect fertilizing, but I am convinced that it is easy to waste money in applying plant-food where it may not be needed. Stable manure is most largely used, but is not a well-balanced fertilizer. It gives particularly good results with currants and gooseberries. Upon strong moist soils it

must be used with caution, especially upon red raspberries and blackberries; otherwise it may cause excessive growth, with consequent lack of hardiness and diminished fruitfulness. It is best applied in fall or early winter, that it may become available during the early part of the growing season. If applied in spring it may cause a late fall growth, with increased loss from winter-killing.

Upon the grounds of the Rhode Island Experiment Station, plots which have received no fertilizer of any sort since 1890 have in some cases given as good yields of raspberries and blackberries as plots which have been given a good dressing of chemicals every year during that time. Plots treated with mineral fertilizers alone have, in nearly every instance, outyielded plots where nitrogen was used in connection with them. These results are tentative only, because while the fertilizer application has been carried on long enough to give reliable results, only the first season's yields of bush-fruits are available. The yields and the appearance of the plants growing upon the plots are significant. The soil is a light, sandy loam, underlaid with a gravelly subsoil, and is naturally unproductive.

All growers agree that potash is the most important element of fertility in fruit-growing. With the tree-fruits it often heightens color; whether it is as important with bush-fruits is not fully determined. From present knowledge it seems probable that 100 pounds of muriate of potash per acre, annually, will furnish an abundance of potash upon most soils. If leguminous cover-crops are employed they will supply all the

nitrogen needed, except under unusual conditions. When necessary, 100 pounds of nitrate of soda or 125 pounds of dried blood per acre should be sufficient. Dried blood seems to give good results in Rhode Island. Phosphoric acid may be supplied by thoroughly working into the soil 250 pounds of floats, which is the name applied to finely ground unacidulated Carolina rock, or an equal quantity of ground bone. In lieu of this preparatory application 150 pounds of acid phosphate or Thomas slag may be applied annually.

SUGGESTIONS ON PLANTING

Planting may be done in spring or fall. In fall the work can be done with less haste and the ground need be worked only when it is in proper condition. If a mulch of manure or earth is placed over the ground the plant will generally pass the winter safely and will be ready to begin growth at once when spring opens. Unless spring planting is done early, before growth begins, the plant will receive a check which will seriously impede the season's growth. A plant set in early fall is able to partially repair the damage to its root-system before the season of growth the following spring. Planting in early spring does away with the extra expense of covering and uncovering the plants and leaves the soil mellow and in good condition for work during the summer. It is the best method for black-caps and dewberries, and will generally be found more satisfactory for other kinds if the work is done

properly and in season. Currants and gooseberries begin growth very early, hence special promptness is needed when planting them in spring.

For increasing a stock of red raspberries or blackberries on one's own grounds young shoots of the present year's growth may be used with excellent results, transplanting them like cabbage-plants, any time after they are four inches high. If much taller than this, cut off the tops. They will be well established by fall. All plants, particularly the red raspberries and blackberries, should be carefully lifted. If carelessly pulled up the plant will usually break at the connection with the root from which it sprung, leaving only a straight stub, poorly equipped for growth.

The individuality of the parent-plant is a point deserving of more attention than it commonly receives. Different plants of the same variety vary widely in productiveness and size of fruit. It is reasonable to expect these differences to appear in the offspring.

The common practice is to plant bush-fruit in rows six to eight feet apart, with plants two to three feet apart in the rows. This is not necessarily the most profitable method. Many excellent growers prefer to plant in check-rows, with plants five to seven feet apart each way, keeping them entirely in hills and doing nearly all cultivation with a horse. This reduces the cost of tillage and secures a finer grade of fruit, a plan especially to be considered when fruit is grown for a discriminating market. In regions of deficient rainfall extra space must be allotted to each plant in order to insure it a sufficient supply of moisture. Check-rows

would seem to be especially desirable under those conditions, though hedge-rows running north and south, or in line with the prevailing winds, may assist in reducing evaporation. On high-priced land in moist climates, or under irrigation, close planting may give better returns, though there is greater danger from fungous diseases. The suckers, which spring up in great profusion in old plantations of red raspberries and blackberries, are more easily controlled by planting in check-rows. A modification of the check-row system is often desirable, the plants being set four feet apart in the row and lined both ways, so that cultivation may progress in either direction while the plants are small and when the old canes are first removed after fruiting.

Planting methods are simple. The previous soil-preparation is of the utmost importance. If that has been thorough it will be easy to put the soil in proper condition to receive the plants. In this connection a bit of the author's experience may be of interest as a warning, not as a guide. When a young country school-teacher, he decided to plant an acre of black raspberries. The plants were ordered and appeared very early in the spring, while the ground was still cold and wet, but what to do with them he did not know, heeling-in being to him as yet an unlearned mystery. A man was hired to plow the ground, which was too wet to work and was covered with a partial sod. Without waiting to harrow it other men were set at work with hoes making little holes and setting the plants in this most uncongenial home. It is needless

to say that this field yielded little profit, except in experience.

The care of young plants when received from the nursery is an important matter. If ordered from a distance it will seldom be convenient to plant them at once. They should be unpacked as soon as received, the bunches loosened enough to bring all the roots in contact with earth when heeled-in, which should be done on the north side of a building or in a cool cellar in moist earth. A shallow trench should be opened with one side somewhat slanting, laying the plants against this side and covering the roots with earth, which should be closely pressed about them. Tier after tier may be packed in this way. Plants so treated will remain in a cool place with safety for some time. If dry when received dousing the roots in water or thin mud before heeling-in is advisable. Even burying the plants entirely in the earth may assist them to recover.

When well fitted the field should be marked and furrows plowed the desired distance apart. If check-rows are used the marking should be done in both directions, to facilitate rapidity of planting, though furrows need be plowed but one way. Most workmen will make a straighter furrow if the land is previously marked, though a good driver will plow them very straight by using stakes and ranging with objects in the fields beyond.

Some successful growers recommend deep planting for all bush-fruits, urging that plants set deep are better able to withstand drought, and will stand up better. The plants are set in the bottom of the fur-

row, but only moderately covered, allowing the furrow to be filled in by subsequent cultivation, after the shoots have started. Deep planting is not always satisfactory, especially with tips. If the subsoil is heavy and hard the plants will lose more than they gain. Experiments at the Nebraska Experiment Station gave uniformly better results from shallow planting of black raspberries.

In mellow ground the plants are quickly set by drawing the earth about them with the hands and firming it with the hands or feet, leaving the furrow to be filled in with a hoe or by subsequent cultivation. When two or three persons are planting together one should carry the plants in water and drop them just in advance of those who are setting. He should never be allowed to get ahead of the planters, for every exposure to sun and wind, even though brief, lessens the vitality of the plant. If one person is working alone, the plants may be carried in a pail containing some water.

MANAGEMENT OF THE LAND

Some return may be obtained from the land the first year by planting hoed crops between the rows. In many cases nothing will be gained by this practice. Under intensive culture it can be done with profit, but with common farm methods what is gained by the catch-crop is likely to be more than lost in diminished growth of the fruit-plants.

Cultivation during the first year differs little from that of other hoed crops. Frequent stirring of the

soil to destroy weeds and preserve a dust-mulch upon the surface is demanded. The grower cannot afford to allow weeds to usurp food and moisture which belong to the plants; neither can he afford to allow the moisture to evaporate from the soil by neglecting to mulch it with dust. As in every horticultural operation, the better the tillage the better the growth.

Each succeeding spring tillage should begin early, using any implement which will loosen the soil thoroughly and leave the ground level. The soil immediately about the plants should be loosened with a hoe or rake so that the whole surface may be mellow and in good tilth. If done early this is not a serious task, but if neglected until the ground becomes hard and the weeds have started it is difficult and expensive. A shovel or spade can sometimes be used with advantage in first turning the soil. Some growers plow between the rows in spring, but this is undesirable, since it may injure many of the roots and leave the land in ridges. Plowing is especially undesirable among currants and gooseberries.

Most writers recommend that tillage should cease by July or August to permit the plants to ripen their wood before winter. Other men of wide experience, whose opinions carry much weight, believe that tillage should continue throughout the entire season. It is a point still open to discussion and one upon which more light is needed. Much depends upon the locality and the season. In semi-arid climates, like that of the Plains, there is little danger of inducing too great fall growth by continuous tillage. There is more danger

that the plants may go into winter quarters with a deficiency of moisture in the soil. In Nebraska continuous cultivation gives good results.

Mulching to replace tillage is often suggested. In the home-garden where tillage is often difficult, owing to the smallness of the plots or the inconvenience of getting at them with a horse, mulching may be the most satisfactory, but in field culture no other mulch is so practicable as that formed by a layer of mellow, frequently-stirred soil. The chief objections to mulching are the difficulty and expense of obtaining material, the labor involved in applying it and the fact that mulching induces surface rooting of the plants. In tilled land the roots are kept below the part which is stirred and if neglected this part remains to protect them. With mulching the roots come close to the surface, where they are quickly injured if the mulch is allowed to disappear.

On very rich soils in moist climates continuous cultivation may induce too rampant wood-growth. Under such conditions cultivation is sometimes abandoned after the second year, the ground being seeded to clover, which is cut when the fruit begins to ripen and left on the ground for a mulch. A practice in vogue on the Thayer farms in Wisconsin is to grow clover on other land, to be cut and spread along the rows, while tillage is maintained in the spaces between.

Cover-crops have not been largely used among bush-fruits heretofore, but there is good reason to believe that they can be employed with advantage. If legumes are used all the nitrogen which is needed may be thus obtained. If too much results, non-leguminous crops

should be substituted. Where crimson clover thrives it makes an excellent plant for this purpose, forming a dense close mat to aid in winter protection of the roots and in the prevention of heaving. Its chief objection lies in the fact that it involves extra labor to destroy the plants in spring.

TILLAGE TOOLS

Few special tools are needed in the bush-fruit plantation. A cultivator is the first and most important implement. Any kind which will thoroughly loosen the soil and leave it level will serve the purpose. It should be one which will do good work when widely spread, for with full-grown bushes it is impossible to work close to the plants except with a wide tool, the wings of which can run beneath the branches. For suckering varieties it is decidedly advantageous to have teeth which are square on the end instead of pointed, as most cultivator teeth are. Square teeth will cut off the suckers beneath the surface of the ground, while ordinary kinds permit most of them to escape. Such teeth are also useful in cutting off Canada thistles and other deep-rooted weeds which often escape.

In soil which is free from stones, knives or cutting blades of steel can be made by a blacksmith and attached to an ordinary cultivator, so that they will follow and either cut or uproot everything which escapes the teeth. Such a device is used by E. T. Hartley, of Lincoln, Neb., for cutting off plum-sprouts.

In mellow soil a scuffle-hoe is useful for working among plants which have become large and spreading.

The crescent scuffle-hoe answers this purpose admirably. If preferred, and the materials are at hand, one can be made by riveting the outer tines of an old fork to a piece of bush-scythe, as shown in Fig. 1.*

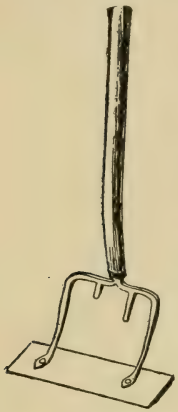

Fig. 1. Home-made scarifer or scraper.

In this connection two devices for the horse which does the cultivating should be mentioned. One is a wire muzzle, in the shape of a basket, which can be slipped over the nose and buckled into the bit-rings. With such a device to prevent the horse from nipping the plants he will keep his place in the row and do his work better. The other device is a leather apron, to be worn on his breast, which will save him many an ugly scratch. It is generally necessary to keep the horse close to one row to make the cultivator reach under the bushes, and this apron will materially aid in doing it.

PRUNING

The old canes of raspberries and blackberries are best removed and burned as soon as fruiting is over. Any insects that may be contained in them are thus destroyed. The canes can be more easily cut at that time, for they are still soft, while by spring they become very dry and woody. This early removal offers a good opportunity to clean up the plantation and culti-

* Other patterns of useful tools are illustrated in "Garden-Making."

vate close to the bushes. Though the fruiting-habit of currants and gooseberries is different from that of brambles, a similar principle of renewing the fruiting-wood may be used with advantage. Fruit borne on old wood becomes deficient in size. It is better therefore to cut out all parts more than two years old and allow the younger shoots to take their places. This is preferable to shortening-in the shoots, for that induces additional branching and a dense undesirable form of bush.

Some implement is needed for cutting out the old and superfluous canes. The work can be done with long-handled pruning-shears, with a corn-cutter or with an ordinary bush-scythe, but some form of hooked knife, small enough to work among the canes easily and cut one at a time, is more convenient. A good tool of this kind can be made from a flat file, properly bent and sharpened, then firmly driven into a shovel or manure-fork handle, as shown in Fig. 2. William A. Brown of Michigan reports * that after trying many devices he prefers a tool similar to this hook, but made from a piece of bush-scythe riveted to a flattened shank and driven into a handle. He also recommends a special rake for use in gathering up the old canes when through pruning. It consists of a head piece of 4 x 4 scantling 5

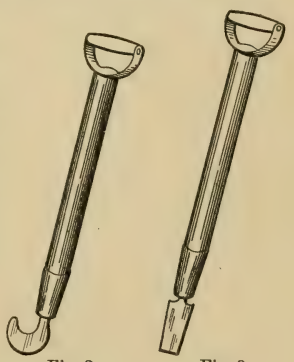

Fig. 2. Pruning-hook. Fig. 3. Pruning-spud.

*Michigan Horticultural Society Report, 1886, p. 406.

feet long. Into this are fastened seven teeth of ¾ inch round iron, 18 inches long. Poles at right angles to the teeth serve for shafts and a bow is attached to the head-piece for handling it. By means of such a tool the canes can be quickly gathered into piles in the rows, from whence they can be loaded on a hayrack and drawn away. A spud similar to that shown in Fig. 3 is often useful in cutting out the canes or in cutting off soft young suckers. It may also be used with advantage in putting down the tips of black-caps.

For the spring pruning, which consists chiefly of shortening-in the laterals, light, quick and easy-working shears are needed. If the canes are not too large and woody a good pair of sheep-shears is most convenient. For nipping back the new growth in summer a long-bladed knife or sickle with a keen edge will be found convenient, particularly on young bushes where the young shoots are so exposed as to allow them to be clipped readily. On older bushes, where the young shoots need to be clipped below the height of the older canes, sheep-shears are better, though the thumb and finger may be equally good.

It is necessary to go over the plants more than once, since it is very important that the shoots be pinched when they reach the desired height. If allowed to grow taller, then cut back, the laterals will not push forth so vigorously. If only the tip is removed from a tall shoot the resulting bush will be top-heavy and unable to hold up its load of fruit.

For full discussion of the principles and practice of pruning, consult "The Pruning-Book."

WINTER KILLING

The hardiness of the varieties which he cultivates is a point of great importance to the grower. The question of what constitutes hardiness has puzzled growers much, and is still unsettled. That the conditions of the season and of growth affect in great measure the ability to endure the following winter is certain, although if a variety is constitutionally tender in a given locality, there is little hope that any kind of treatment will make it hardy. Disease or the intense heat of summer may so weaken plants that they are unable to withstand the most favorable winters, while strong, healthy plants will often endure the most trying ones unhurt. Raspberry plants taken up and removed to the forcing house in the fall of 1892 showed all the ordinary symptoms of winter killing when starting into growth under glass, yet they had been subjected to only enough cold to admit of a ball of earth being taken up with them when transferred to the house. It is generally believed that after a comparatively dry fall, favoring a slow, well ripened growth, plants endure the winter best, but even this theory of well ripened wood is still open to doubt. It is certain that slender canes produced during the latter part of the season often winter-kill less than those of the whole season's growth. It is unsafe to assert from this, however, that immature wood is hardier, for canes produced late are smaller, and may make firmer, better ripened wood than those of earlier and more vigorous growth.

There are some very successful berry-growers whose practice is directly opposite to this theory, for they believe in thorough and frequent cultivation up to the time of frost. This tends to favor a late fall growth, producing at least some wood which cannot be well ripened when winter sets in.

In many localities winter protection is an essential feature of berry growing, and many growers find it profitable even where it is not absolutely necessary. The increased yield, even in mild climates, often more than pays the cost of protection, and a crop of fruit is thereby insured, even though the winter should be an unusually trying one.

Different methods are employed for laying-down the canes. Some drive over the rows with a wagon, and the axle bends the plants all in one direction. If mulch of any kind is used for covering, like sorghum, bagasse or coarse manure, it can be thrown from the wagon on to the plants at the same time. A fence rail is sometimes used to bend down a section of row at once, leaving the rail there to hold them down. A simple and practical way is to remove a little earth from the side of the hill with a spading or manure fork, bending the plant down in that direction and throwing enough earth over the tips to hold it there. The plants are usually all laid in one direction along the row, the tips of one lapping over the roots of the preceding. In very severe climates it is best to entirely cover the plants with earth. This is sometimes done by running a plow along the row, and throwing the furrow over them after they have been

laid down. The objection to this plan is that it injures the roots, and with suckering varieties, causes more suckers to spring up, so that the time saved is lost again in fighting the suckers the following season. Some plow a furrow along the row the first thing, and turn the plants to the side, but that plan is open to the same objection.

This laying-down can be done at any time after growth stops in the fall, but before the ground freezes. In some instances no injury has followed covering while yet in full leaf, with several weeks of mild weather following. The time of taking them up in the spring, however, is of greater importance, for if lifted early, with severe weather following, they are much more apt to be injured than plants which have not been covered would be by the same temperature. If left too late, growth may begin while they are still covered, rendering them very sensitive to even light frosts when exposed. It is always better, if the work can be so timed, that a few days of mild weather shall follow the date of lifting.

The cost of protecting in this way is variously estimated. T. T. Lyon reports a large plantation of Wilson Early blackberries bearing a bountiful crop, which had been laid down at a cost not exceeding $1.75 per acre. In Wisconsin, where much of it is done, the cost of laying-down blackberries and lifting them again in spring is estimated at about $5 per acre.

The verdict of all growers who have practiced laying-down is so unanimously in its favor that there can

be little doubt that in all regions where the winters are especially severe or trying, it will certainly pay to lay down both raspberries and blackberries. A writer in American Garden in 1890 makes the statement that he can insure a quart of blackberries a minute, for the time spent in laying them down. Some growers advise less vigorous summer pruning, or none at all, where plants are to be laid down. Others who practice laying-down very extensively also prune severely.

Bailey writes* as follows on this subject: "Blackberries and raspberries are extensively laid down in cold climates, and it may be well to relate the method here for the benefit of those who occupy bleak locations. Late in fall, the bushes are tipped over and covered. Three men are generally employed to perform this labor. One man goes ahead with a long-handled, round-pointed shovel and digs the earth away six inches deep from under the roots. The second man has a six-tined or four-tined fork which he thrusts against the plant a foot or so above the ground, and by pushing upon the fork and stamping against the roots with the foot, the plant is laid over in the direction from which the earth was removed. The third man now covers the plant with earth or marsh hay. Earth is generally used, and if the variety is a tender one the whole bush is covered two or three inches deep. Hardy varieties may be simply held down by throwing a few shovelfulls of earth

*"Principles of Fruit-Growing," 98.

on the tops of the canes, thus allowing the snow to fill in amongst the tops. If the grower lives in a locality where he does not fear late spring frosts, the bushes should be raised early in the spring; but if frosts are feared, they may be left under cover until corn-planting time. If the buds become large and are bleached white under cover, they will suffer when exposed to the atmosphere; and one must watch the bushes in spring, and raise them before the buds become soft and white. This method of laying-down blackberry plants costs less than $10 per acre, and the slight breaking of the roots is no disadvantage. Some growers dig the earth away on both sides of the row, and still others bend over the canes without any digging. Whatever method is employed, the operator must be careful not to crack or split the canes. The method can be varied with different varieties, for some bear stiffer canes than others."

The same author writes* again as follows: "The tops of plants may be laid down for the winter. Fig. 4 shows a method of laying down blackberries, as practiced in the Hudson River Valley. The plants were tied to a trellis, as the method is in that country, two wires *(a, b)* having been run on either side of the row. The posts are hinged by a pivot to a short post *(c)*, and are held in position by a brace *(d)*. The entire trellis is then laid down upon the approach of winter, as shown in the illustration. The blackberry tops are so strong that they

*"Garden-Making," 62.

hold the wires up from the ground, even when the trellis is laid down. To hold the wires close to the earth, stakes are thrust over them in a slanting position, as shown at *n n*. The snow which drifts through the plants ordinarily affords sufficient protection for plants which are as hardy as grapes and

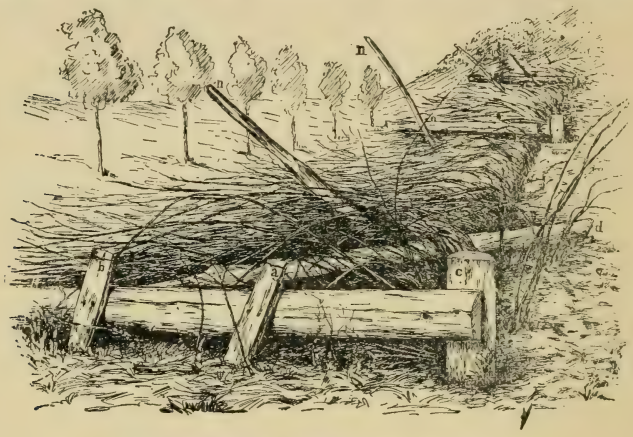

Fig. 5. Laying-down trellis-grown blackberries.

berries. In fact, the plants may be uninjured even without cover, since, in their prostrate position, they escape the cold and drying winds."

In this connection it should be noted, that severe cold is not the only cause of winter-killing. In Nebraska, red raspberries and blackberries are commonly killed to the ground if left unprotected, while black-caps fare only a little better, yet the climate is no colder than in New York or Pennsylvania, where protection is rarely given. The winter of 1895–6 was

an exceptionally mild one, the mercury falling below zero but once at Lincoln, and then only five degrees below, yet the destruction was as complete as ever.

Young plants of the Taylor blackberry were uniformly killed to the ground during this winter, while plants in adjoining rows, of the same age and in every way comparable, but which were laid down and covered, came through perfectly green to the tips. The following winter, 1896–7, was much colder, but the preceding summer and autumn had been favorable, with plenty of rain, and the plants went into winter quarters with abundant moisture in the ground. Contrary to their usual custom, and in spite of much lower temperature, both raspberry and blackberry plants came through the winter in good condition without protection. Drought is more disastrous than cold in Nebraska.

PROPAGATION*

The common methods of propagation consist in a division or continuation of the parent plant by means of tips, suckers or cuttings, according to the habit of the species. Reproduction from seeds, by means of which new varieties are obtained, is the same in all. When the fruit is thoroughly ripe the seeds should be washed out of the pulp in water, and may then be sown at once, or first dried, like other seeds, and sown later. There is reason to believe that a larger proportion of the seeds will germinate the first spring after sowing if put in the soil at once, than if dried and

*For extended discussions of propagation of plants, see "The Nursery-Book."

kept some time before sowing. Certain it is that by the latter method most of them remain dormant during one whole season, germinating the second spring. Unless they are to be sown in very large quantities, gardeners' flats, about two feet square and five or six inches deep, will be found most convenient. The soil used should be rather light and porous, one which will not bake or pack hard. The seed may be sown in rows two or three inches apart, or broadcast over the surface of the ground. Cover lightly about one-fourth of an inch deep. The boxes can then be put outside in a protected, shady place, and left till the seeds germinate. If the seeds are the product of crosses or particularly choice selections, so that they need to be kept pure, the flat should be covered with a fine screen to prevent the possibility of birds dropping other seeds into the same box, as might easily happen, especially if the box has been placed under trees to secure the desired shade. The only attention required from this time on is to see that the soil is not allowed to dry out enough to injure the germinating power of the seeds. Weeds should also be pulled out as they appear. As soon as the plants are strong enough to bear handling, they should be potted off or reset in other flats, putting them two or three inches apart each way. The flats or pots in which these young plants are growing should be well plunged in the soil to avoid drying out. This is of especial importance in getting the plants through the winter safely, for lack of moisture in winter is as destructive to plant life as lack of moisture in summer. After one

season's growth the plants may be strong enough to be set in the open ground, but they need mellow, well-prepared soil and careful attention, for most of them will still be small and weak. Growing plants from seeds is a slow process, and in the majority of cases the offspring will show nothing superior to the parent or to other varieties already in cultivation.

THINNING THE FRUIT

Thinning is often advantageous with the larger fruits, and is easily done with berries by clipping off a part of each cluster or some clusters entirely. A limited experiment to test the value of such practice did not give encouraging results with either raspberries or blackberries. The eye could detect no increase in the size of the berries on thinned plants, and, since the principal gain would be in the increased size and attractiveness of the fruit, it seemed to fail of its purpose.

As a matter of fact, the thinning is done at the annual spring pruning, and if the proper balance has been obtained then, there is no need of further reducing the number of fruits.

EFFECT OF SPRAYING ON POLLINATION*

It is generally supposed that rainy and cloudy weather at blossoming time is injurious to the fruit crop, and the question occurs whether frequent spraying with water at this period would produce any no-

*Fred W. Card, Bull. 57, Cornell Exp. Station.

ticeable effect. On June 15, 1892, spraying was begun on Caroline, Cuthbert and Turner raspberries. At that time the Caroline was well in bloom, while the others were scarcely beginning to bloom. The spraying was continued until July 1, two to four times each day when the weather was bright and pleasant, but omitted when there were rains to take its place. Showers were frequent during this period, but were well interspersed with bright weather and sunshine.

The results were entirely negative, showing no effect whatever from the spraying. The fruits on this part of the row were just as perfect and abundant, and the plants appeared to suffer no more from fungous diseases than those not sprayed. It is to be noted, however, that the conditions were not the same as those present in continuous cloudy weather, for during much of this time the weather was bright and insects were numerous, and continued working among the blossoms regardless of their being wet, so that opportunities for pollination were good.

The test is of interest as showing that there need be no fear of interfering with pollination by spraying for insects or diseases, even if necessary to do it at blossoming time. Of course, it should not be done at that time, ordinarily, on account of the bees.

FORCING RASPBERRIES AND BLACKBERRIES*

When the ground began to freeze in the fall of 1892, several strong raspberry and blackberry plants

*Bull. 57, Cornell Exp. Sta.

of bearing age were dug about, and, when frozen, the ball of earth, with the plant, was lifted and transferred to boxes about twenty inches square in the forcing-houses. They were placed in a cool or lettuce house and came on very slowly, the temperature evidently being too low for them, and no fruit ripened before April. One plant placed in a warmer house came on much more rapidly. As spring approached, bringing higher temperature and more sunshine, the plants began to blossom freely. At first no hand-pollinating was done, but it did not take long to see that no perfect fruit would be formed without it, and afterwards the flowers were pollinated as they appeared, with good and perfectly normal fruit as the result. This can be quickly done by knocking off the pollen and catching it in a spoon or a small watch-glass set in a convenient handle of wood, the pistils then being dipped in this pollen.

With young plants, started in boxes or large pots in spring, so as to be well established when transferred to the forcing-house in the fall or winter, there seems to be no reason why good crops of raspberries and blackberries cannot be grown under glass. They appear to require a comparatively high temperature, however, and demand artificial pollination.

SUGGESTIONS ON PICKING

Always avoid picking when the fruit is wet, unless made absolutely necessary by continued showery weather. Fruit put in the baskets wet can seldom

come out in good condition, and must reach the consumer very promptly in order to avoid molding and loss. But whatever the condition when picked, it should be promptly brought to a cool, shady place, where plenty of air is accessible, and go from there to market and to the consumer with the least possible delay. A spring-wagon of some kind is a necessity for transporting it, and good roads over which to travel add wonderfully to the value of a location. If very large quantities are to be handled, it may pay to have a special truck wagon, with springs and a broad top reaching beyond the wheels, or springs may be made to fit the bolsters of the ordinary farm wagon.

With a business of any considerable extent, it is absolutely necessary to have some systematic method of keeping account of the amount of work done by pickers. Several methods are in general use. One of the simplest is to have printed tickets, which are given out as the berries are brought in, exchanging them for higher denominations as occasion requires. At the end of the day's work these can be surrendered and the amount credited in a book or billet kept for the purpose. The tickets are considered the same as money when given out, and if lost, it is the picker's loss and not the owner's.

Another plan in use to a certain extent, and which is very simple and satisfactory, is to fasten a card, by means of a safety-pin, to the shoulder of each picker, and then indicate the number of quarts brought in each time by punching the card, crediting up at the

end of the day, as before. The cards can then be kept by the pickers as vouchers on their part, to guard against errors on the books.*

One of the greatest difficulties in managing a crowd of pickers is to get the fruit picked clean, and it is an absolute necessity to have a rigid system of assignment to rows, with a careful foreman almost constantly in the field to go over the work frequently and see that it is well done. The shiftless picker must be made to go over the row again. From a limited experience in managing a crowd of city urchins in experimental gardens, where an assignment of rows was impracticable, I can speak with full assurance concerning the importance of this precaution.

Another precaution nearly always necessary is to reserve a portion of the price per quart, usually half a cent, until the close of the season, with the understanding that only those who work through to the end shall receive the full amount. If this is not done, the amount of "headache" and the number of other excuses which will develop will be something astonishing, and the outcome will be that a few conscientious pickers will be left to finish up the poorer picking, with inconvenience to the grower and injustice to them. Some overcome the difficulty to a certain extent by varying the price with the condition of the picking, but this plan must lead to more or less confusion.

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*Consult Chapter viii., "Principles of Fruit-Growing," for further discussion of these questions.

PACKAGES AND MARKETING

As the season of marketing approaches, an abundance of packages, of a kind suited to the demands of the market available, will be needed. Many styles of crates and baskets are offered, and it is sufficient to say that some form of the standard thirty-two quart crate, holding full dry measure quart baskets, is always to be recommended. If a near-by market can be depended upon to absorb the crop, a good, substantial, well-made crate is desirable; one which will make its lightness and durability of value in the repeated handling. On the other hand, if fruit must be shipped some distance, there will be an inevitable loss of crates and baskets, and it may be found better to use gift crates altogether, or at least one which is cheap enough so that the loss of those which never find their way back will not be seriously felt.

A very cheap and satisfactory crate was fully described several years ago by E. W. Reid, of Ohio,* and is the style universally used in that vicinity. The material is bought from the planing mill, sawed ready for nailing together, and put up at home during the winter. Being in small pieces, much of it can be cut from cull lumber, which makes the price more reasonable. I copy Mr. Reid's figures, together with the estimated cost and directions for making. Here is the cost of one hundred crates at that time in his locality:

*Popular Gardening, iii. 158.

Lumber, ready to nail	$30 00
Nails	3 00
Leather for hinges and fastenings	1 50
1 gross of buckles (144)	80
1 man 4 days, $1 per day, to put together	4 00
Total	$39 30

The following are the dimensions:

		Length	Width	Thickness
End		16 in.	11 in.	1 in.
Side		24½ "	12 "	½ "
Strips for side and bottom	6	24½ "	3 "	⅜ "
	4	24½ "	2 "	⅜ "
	3	24½ "	3½ "	½ "

In Fig. 5, *A* shows the solid end, with hand-hole sawed with circular saw; *B*, the lid, worked on leather hinges, and fastened with strap and buckles. The three side strips marked *C* are three inches wide, those marked *D* are two inches wide. The bottom strips are three and one-half inches wide and one-half inch thick. *F* shows the fastenings and hinges. The side and bottom slats are arranged so that the openings come about the middle of the baskets in each tier, giving good ventilation, and holding the baskets firmly in place.

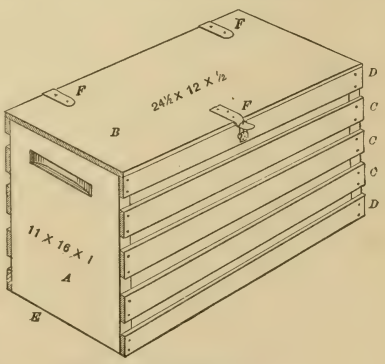

Fig. 5. A useful berry crate.

The tray used between the tiers of baskets is shown in Fig. 6, the size of the pieces being as follows:

	Length	*Width*	*Thickness*
2 strips	22½ in.	1⅝ in.	¼ in.
1 "	22½ "	2½ "	¼ "
5 rails	11 "	¾ tapering to ¼ at bot.	1 "

The outside rails taper on only one side. This tapering of the cross-pieces is a great advantage, allowing them to rest on the sides of the baskets without crushing the berries, and since they are an inch high they make it possible to round up the baskets as they should be and still keep the top presentable. It will be easy to modify the dimensions and styles to correspond to any form of basket that circumstances may make advisable, but the figures and dimensions given will serve as an excellent basis on which to work.

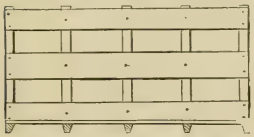

Fig. 6. Tray used in the crate.

For nailing up the crates, some kind of form is of great service. This can be made from a good, solid box, by cutting slots in the side exactly opposite and the right distance apart for the end pieces. This will make it easy to put up each crate true and square, and it can be done much quicker than without such a device.

Picking-stands holding four quart baskets each are a necessary addition to the outfit. They enable the pickers to keep their fruit safe and clean, preventing much inconvenience in tipping over and spilling.

Carriers exactly like these, but long enough to hold eight baskets instead of four, are always convenient to have in gathering up and carrying berries from the field. They consist of a plain slat frame with four short legs to raise them slightly from the ground, and a handle something like those used on grape baskets. The stands can be bought of dealers in fruit packages at reasonable prices, or can be put up at home in winter.

It will seldom pay to buy the quart baskets in the flat and nail them up at home. In the end they are pretty sure to cost as much and probably more than if bought ready for use. Very few workmen have the knack of systematizing work of that kind, and making quick motions that will count to good advantage. The average man will go at the work with about the same speed that he would use in shoveling a load of sand, and the result is that, when night comes, if the value of his day's wages is divided by the number of baskets he has made, the chances are that they will be found to have cost a good round price. The chief advantage in making at home is to utilize time of comparatively little value when it is desirable to keep a steady force of help throughout the season. For currants, and especially gooseberries, the ordinary grape baskets are much used, and in many cases will be found more satisfactory than quart baskets, particularly for shipping.

Selling the product is one of the most essential features of the whole business. Many a man can grow fruits successfully, but fails because he cannot market

them well. Yet nobody can tell him how to do this part of the work. It is largely a special problem, to be worked out for each individual case, and the man who fails to make a careful study of his conditions and to devise plans for the satisfactory disposal of his products, will surely fail, and there is no help for it.

REMARKS ON CROSSING BERRIES*

It is only within comparatively recent time that the necessity of careful, systematic plant-breeding has been recognized, and the history and development of horticulture is a conspicuous evidence of the fact. Animal breeders have long recognized the necessity of working along definite lines with definite aims in view. Horticulturists, on the other hand, have for the most part been content to take what they found and call it good, at least until something better appeared. In looking over the history of American varieties of fruits, one can hardly fail to be struck by the almost continuous recurrence of the phrase, "a chance seedling," "found growing," and the like. The sooner we begin to work for what we want in accordance with scientific principles and with a definite purpose in mind, the sooner will we see the progress and improvement for which we hope.

To some the terms crossing and hybridizing may convey the idea of something too scientific and too difficult for the majority of people to undertake. On

*The whole question of breeding by means of crossing is discussed in Bailey's "Plant-Breeding".

the other hand, there is reason to fear, from the number and character of many of the so-called crosses introduced from time to time, that many have far too loose an idea of what crossing really means. While there is nothing particularly difficult in the operation, it is, for the most part, slow and delicate work, and requires extreme care to insure certainty as to the purity of the results. We have no right to assert that a plant is a cross unless we know beyond peradventure that no other pollen except that of a given parent has been allowed to reach the stigma of the flower which developed the seed from which the plant in question was produced. The mere fact that pollen of a given variety has been applied to the stigma of another variety is no evidence that crossing has taken place. In order to explain the methods of crossing, and to show what results may be expected, this record of experience is inserted.

The methods of crossing vary with the character and structure of the flower in question, but the essential feature is the same in all cases. The pollen of the flower which is to serve as the female parent must be carefully and completely removed before it ripens, then the flower must be carefully covered until the stigma is ready to receive pollen and admit of fecundation. The flowers of the male parent should also be carefully covered before opening, to prevent the admixture of pollen from any other plants. At the proper time this pollen is conveyed to the stigma of the protected flower on the female plant, and the flower again covered until it has reached such a stage that

fecundation is no longer possible. If properly fertilized by the pollen applied, the stigma very soon withers, but if not, it may remain in a receptive condition for several days.

In crossing brambles or groselles, select a cluster which has several buds nearly ready to open, if such a one is to be found. Cut off all younger buds, all which have already begun to open, all flowers and all fruit which has already set, leaving only the few unopened buds which are of about the same age. The next step is to remove all stamens from these buds. As the number of stamens is large, to remove each one separately would be a tedious task. Fortunately, however, in the rose and saxifrage families, to which these fruits belong, the stamens are borne on the calyx. This enables us to get rid of them all by simply cutting away the calyx. This can be conveniently done either with fine, sharp-pointed scissors, or with a spatula made from a pin stuck in the end of a stick, then flattened and sharpened at the edges. Turn the bud (Fig. 7) bottom side up, and cut a circle around the stem not far from it. The whole calyx will then come away, taking the stamens with it (Fig. 8). After all the buds have been thus treated, care being taken that no anthers are left, the cluster is covered with a paper sack. Half or quarter-pound grocers' sacks answer the purpose well. If the open end of the bag is moistened, the paper can be pressed more closely

Fig. 7. Raspberry bud ready to emasculate.

about the stem. Some flat tying material is best for tying, raffia being most convenient if at hand. At the same time, a cluster on the variety which is to be used as the male parent should be covered in the same way, in order to have pure pollen to apply at the right time. When first emasculated, a raspberry bud will have much the appearance of Fig. 8, but usually in about two days, in warm weather, it will have developed far enough to be ready for pollination. It will then have the appearance of Fig. 9; the styles will be extended and spreading, and the stigmas will have a sticky look, indicating that they are in a receptive condition. Blackberries often require several days to sufficiently develop after emasculation, especially late in the season if the weather is cool.

Fig. 8. Emasculation completed.

When the stigmas are ready, uncover the cluster from which the pollen is to be obtained, select a blossom from which it dusts out freely, and apply it to the ones to be fertilized. The pollen may be collected and applied with a spatula or camel's-hair brush, but if in the right condition, applying the flower direct is the simplest way. The pollinated cluster must then be at once covered, as before, and left for a week or ten days. At the end of that time, if all the stigmas have shriveled away, the paper sack may be replaced by one of mosquito netting, which will admit light and air, but still protect the fruit from birds and boys.

In case of the brambles, the result will often be an imperfect berry. Only a few of the akenes are

likely to be fecundated, and there may not be enough to fill out all the space on the receptacle (Fig. 10). When the fruit is ripe the seeds should be planted and cared for as heretofore directed for growing plants from seed, except that especial care should be used in all the operations to avoid mixture, or injury to seeds or young plants. Crossing requires much time, and accidents are liable to occur all along the line, so that the result of a summer's work may be, in the end, only a few plants, most or all of which are worthless. Yet persistent effort in this line should be encouraged, and in time the results are likely to repay all the attempts made.

Fig. 9. Ready to pollinate.

Fig. 10. Result of incomplete pollination.

During the summer of 1890 considerable work was done by the writer in crossing different varieties and species of raspberries and blackberries in the horticultural gardens at Cornell University. A number of plants came through to fruiting age. Notes were taken in the summer of 1894 on all those which had then begun to fruit. The substance of these notes is given below, and may prove of interest as showing some of the tendencies exhibited. In writing the records of crosses, the seed-bearing parent is placed first. For example, "Gregg × Shaffer" means that pistils of Gregg received pollen from Shaffer.

GREGG × SHAFFER *(Rubus occidentalis × R. neglectus)*

Five plants from seed of Gregg, fertilized with pollen of the Shaffer, were growing and fruiting. Four of them resembled the Gregg much in character of plant, and one approached more nearly to the Shaffer. In character of fruit cluster three were more or less elongated like Shaffer, and two more closely aggregated like Gregg. The fruit varied in character between that of the two parents, in one case closely approaching Shaffer, in others more nearly intermediate or nearer the Gregg. The color in some of them was much like that of a black-cap not fully ripe.

FONTENAY × CUTHBERT *(Rubus Idæus × R. strigosus)*

There were five plants of this, four of which did not germinate till the second spring after sowing the seed, and were fruiting but little. Three resembled the Fontenay in character of growth, one the Cuthbert, and one was intermediate. The little fruit thus far produced showed no value.

SHAFFER × CUTHBERT *(Rubus neglectus × R. strigosus)*

Thirty-one plants of this cross were growing, showing various intermediate stages between the two parents. The majority thus far seemed to resemble the male parent in character of plant and in propagation by suckers. Of the older plants, which were fruiting well, some produced typical red raspberry fruits as light, and in some cases possibly even brighter, than Cuthbert in color; others were darker, and resembled Shaf-

fer more. One in particular bore a large, bright red berry, resembling Cuthbert in shape and flavor, and promised well. Another, bearing a smaller, darker berry, seemed to be productive, and the flavor was very rich and good, much better than most varieties.

CUTHBERT × SHAFFER (*Rubus strigosus* × *R. neglectus*)

Three plants of this cross showed various intermediate characters, but nothing especially promising.

ADA × CUTHBERT (*Rubus occidentalis* × *R. strigosus*)

Of this cross there were three comparatively weak plants, none of them yet bearing fruit. All seemed to resemble the male parent more than the female parent in character of cane. There was then no indication as to the method of propagation.

In addition to the above crosses between different species or types, there were three plants of Cuthbert × Turner and seven of Turner × Cuthbert. None of them were bearing sufficiently well to judge of their value. In general, they showed the same intermediate gradations which were to be seen in the other cases.

Observations made the following year by E. G. Lodeman and C. E. Hunn showed nothing of value among any of these plants. One lesson which the results of the work as a whole made plain is that really useful varieties are to be obtained by commingling closely related varieties or types, rather than those distantly related, a lesson which has been taught in many other ways before.

Part II

THE BRAMBLES

CHAPTER II

THE RED RASPBERRIES

In this discussion of the red raspberry, three types of fruits are included,—the foreign or European class, the true American reds, and the hybrid reds or purple-canes. Types of the first class are Antwerp and Fontenay, of the second, Cuthbert, of the third, Philadelphia and Shaffer.

SOIL

Like the other members of the bramble family, the red raspberry can be made to succeed on almost any kind of soil, the prime essential being that it shall be well-drained and retentive of moisture. An upland sandy or clay loam is likely to give the best results. The land should be of moderate fertility, rich enough to produce liberal crops of fruit without being so strong as to cause an over-vigorous growth of canes. This over-richness is apt to be the difficulty with bottom lands, or any other low and moist location. Such rapid

growth not only tends in itself to decrease productiveness, but the wood is usually not sufficiently dense and well ripened to stand the winter. A stiff, hard clay is equally unfavorable, and any soil which is wet and soggy during any considerable portion of the year is sure to result in at least partial failure. The raspberry is one of the first of all fruits to suffer from excessive moisture in the soil. On the other hand, it quickly suffers from drought at ripening; hence the demand is for a soil which, while never surfeited with moisture, is at the same time sufficiently retentive to be able to supply it in sufficient quantities throughout the season.

The variety has something to do with the choice of soils. The more vigorous the variety in habit of growth, the lighter and drier the soil best adapted to it, as a rule, and *vice versa*. The Cuthbert is one of our most vigorous growers, and usually succeeds well on upland, while some of the more feeble growers, like Hansell, may do better on lowlands.

LOCATION

The cooler the spot the larger and finer the berries. This is the rule with wild berries. Hence a northern exposure which will, in so far as possible, mitigate the scorching sun and excessive heat likely to occur at ripening time, is the one to be sought, particularly in the mid-continental regions. A location which is too hot may be much alleviated, however, by thoroughgoing tillage.

FERTILIZERS

Red raspberries do not need heavy fertilizing unless grown on very unproductive land. On such soil stable manure can be used in limited quantities with good results. Little nitrogen is required, and its application is apt to be money wasted. It may also induce too much growth of cane with ill-developed fruit-buds and deficient fruitfulness. Potash is desirable but is not needed in large quantities. It may be supplied in muriate of potash or in wood-ashes. Fifty pounds of muriate of potash per acre, annually, will supply more potash than the fruit will remove. It should be remembered, however, that part of what is applied must invariably be lost. If phosphoric acid is needed an application of two hundred fifty pounds of floats or ground bone, harrowed in before setting the plants, will supply it. The grower should carefully experiment upon his own soil to determine whether commercial fertilizers are really needed, and if so what. Let the humus-supply be first considered, the chemicals later.

PROPAGATION

Red raspberries attend to their own propagation without aid. The grower is more concerned with destroying the plants which appear than with increasing their production. Most varieties sucker freely, and these suckers must be kept down to obtain satisfactory fruit-production. If it becomes desirable to hasten the propagation of new and desirable varieties they may be

increased more rapidly by disturbing or cutting the roots and by means of root cuttings, in exactly the same manner as described for blackberries. As elsewhere stated, care should be exercised in taking up the plants for setting. They should always be lifted by thrusting some tool beneath the roots and loosening the earth above. They should never be pulled up directly, for this is altogether likely to break the shoot from the root from which it sprang, leaving only a straight stem, with very few fibrous roots on it, from which to develop the root system of the young plant. In this instance, as in every other, good results are to be expected only when the operator informs himself as to methods, and then does the best he knows how.

PLANTING

Most of the directions given for planting the blackberry will apply equally well to the red raspberry, and like that, it is adapted to either spring or fall planting. The chief difference between the two, so far as planting is concerned, is that the red raspberry requires less room. About the same arguments will apply in both cases in regard to the time of planting and to the method, whether in hills or check rows. If in rows, the usual distance is six feet apart and about three feet in the row. The young plants will very soon fill in the intervening spaces, making a solid row unless cut down. Just this fact, moreover, is a very good argument in favor of hill planting. So many suckers are thrown up that the hedge gets denser and broader

as the plants keep crowding outward and narrowing the space between the rows. The result is that soon only weak and spindling canes can be developed, and the whole plantation is virtually crowded out. Of course, there is a remedy for this in persistently and vigorously thinning out, but this is tedious and expensive work, and is very rarely done as it should be. While this difficulty cannot be wholly overcome by any system of planting, still if the plants are in hills and the cultivator kept going thoroughly in both directions, it is largely obviated. Five feet apart each way is about the most satisfactory distance for reds in hills, though some growers plant them as close as four feet. This may prove sufficient for the smaller-growing varieties, but for the more vigorous-growing sorts it is likely to prove too close, though four feet one way might do. It is sometimes recommended to set the plants two and one-half feet apart in one direction, on high-priced land, then tear out every alternate plant after the first two crops and cultivate both ways, the idea being to thus utilize the land more fully at the beginning.

The young shoots of red raspberry plants can be successfully planted early in the summer, and it is often a desirable way of doing. Certainly where the grower can get them from his own fields it is much better to plant them in the early summer while young, than to wait till the following spring to set the same plants, if he is ready to plant and is only being delayed by the lack of plants. Such plants become well established and are ready for a much more vigorous

growth the following spring than one-year-old plants just set. They will also bear some fruit without injury. In fact, a young plant taken up and carefully reset when a few inches high is to be preferred, on the whole, to a one-year-old plant which has had to be shipped some distance from a nursery, and has been planted in the spring of the same year.

In the hot, dry climates of the West, some shade is an advantage to these fruits, and if it can be secured without so close proximity to trees that the moisture and fertility is already sapped from the ground by their roots, it is desirable to get it. Ordinarily this is not an easy thing to do, and the injury is likely to be as great as the benefit.

POLLINATION

The need of planting different varieties together to insure proper fecundation of the blossoms has come to be well recognized in orchard planting, but has not been thought worth considering in planting bush-fruits. It has been taken for granted that the varieties commonly grown are self-fertile. Indications point to the conclusion that many of them are not fully so. I have observed much evidence of imperfect pollination with Early Cluster and Ancient Briton blackberry, Mayes dewberry and Fontenay raspberry, when growing alone. Others may be equally deficient. The Cuthbert bears an abundance of pollen and is apparently fully self-fertile. Its blossoming season is long and it is therefore an excellent sort to plant with other reds.

The Crimson Beauty is an instance of a variety which, while possessing many good points, proved a practical failure over the country at large, mainly owing to its inability to properly fecundate its own blossoms.

TILLAGE

The cultivation of red raspberries should be such that it will not only keep the ground loose and friable, thus diminishing evaporation and unlocking plant-food, but will also destroy the suckers. To this end a cultivator with teeth square on the end instead of pointed, or with a knife attachment, as explained in the discussion of tools, is of great advantage. Of course this assumes that the object is fruit, and does not apply to the man who is growing plants for sale. In spite of the repetition, perhaps attention ought again to be called to the very great importance of frequent cultivation, up to the time of ripening. This alone may easily add 50 per cent to the quality and quantity of the crop. As already stated, this is the best substitute for irrigation, and in many cases is nearly equal to it. Late tillage, up to the time of frost, gives especially good results with the red raspberry, and no one need fear to keep the cultivator going until that time in most localities.

PRUNING

In the pruning of red raspberries, the practice of growers is widely at variance, especially with regard to the summer pruning. A few years ago the common advice, or rather, perhaps, that which appeared

most frequently, was to treat them the same as black-caps, by pinching the growing canes in summer and trimming back the laterals in spring. Individually, growers all over the country have been coming to doubt the advisability of this plan, and to omit the summer pruning. Pinching back the canes in summer seems to have a tendency to increase the number of suckers thrown up, which in itself is a disadvantage unless the plantation is being run for purposes of propagation. Unless pinched low while still very young, the plants do not throw out strong branches, like the black-caps, possibly owing to the fact that the energy of the plant is more readily directed in the line of producing suckers than in the line of developing branches. The effect of stopping the cane after it has reached a height of three feet or more, is only to force into growth lateral buds which might better remain dormant until the following spring. As a rule, they make only an imperfect development, do not become well ripened before growth stops, and are apt to be more or less injured by the following winter. Both my own experience and the information gathered from the experience of others, lead me to believe that the better way to treat the red raspberry is to allow it to grow unmolested during the whole season, merely cutting the canes back to within three, or in some cases even two feet of the ground the following spring. If the canes are to be supported by stakes or trellis, as is sometimes done in garden culture, they may be left longer, say four, or even five feet. Treated in this way, the canes will throw out a sufficient number of

laterals in spring to produce all the fruit which a plant ought to carry. Moreover, these branches are vigorous and healthy, and in better condition to develop a fine crop of fruit than if produced the preceding year, weakened by the winter and now called upon to throw out fruit-bearing shoots. The lessened expense of pruning is an added advantage secured by this method of training.

An exception to this plan may be advisable in case of young and vigorous plantations, or an exceptionally rampant-growing variety. Young plants have not the root development to start out so stocky a cane, and naturally produce a more slender and comparatively longer growth, so that allowing the main canes to grow uninterruptedly, and cutting them back to the desired height the following spring, is likely to remove too great a proportion of the wood, and leave only the weaker and poorly developed buds near the base. For this reason there are some good growers who find it an advantage to pinch back the plants the first one or two years, but not after that. Whenever it is desirable to do this, the important point to remember is to merely pinch off the tip while the plants are young and only a few inches high. Six to eighteen inches is better than higher, provided it is done when the plant reaches that point, but they should never be allowed to grow higher and then be cut back to this point. If stopped at this early age, the main cane will increase in height somewhat, and will be able to throw out strong and vigorous branches, forming a stocky, self supporting bush, well prepared to endure the winter

and produce a good crop of fruit the following year. Such a bush of the Cuthbert variety is shown in Fig. 11. An undesirable form of training is shown in Fig. 12.

AUTUMN FRUITING

Certain varieties of raspberries possess a strong tendency to bear fruit in autumn on wood of the present

Fig. 11. Well trained.

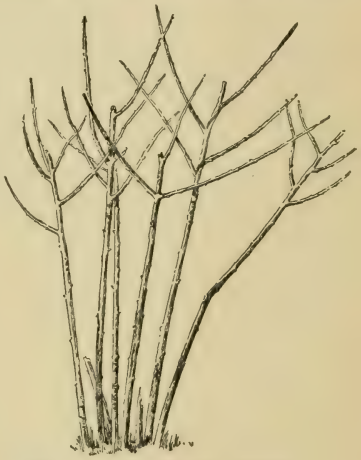

Fig. 12. Improperly trained.

season's growth, and it is sometimes recommended to take out the old canes in spring in order to induce this habit. A single experiment was made at the Cornell gardens to determine whether our common varieties would yield to this treatment. Plants of Fontenay, Cuthbert and Shaffer were mowed off with a scythe in the spring, before the young canes started. The

results were very definite, but not encouraging. The young canes made a vigorous growth, but not a single cluster of flowers appeared on either the Cuthbert or Shaffer plants. There were two or three fine clusters of fruit among the Fontenay plants thus treated, but this is one of the European varieties, which are characterized by more or less continuous fruiting throughout the season. Just as good clusters were to be found, and apparently as many of them, where the plants were treated in the ordinary manner.

The only advantage in autumn fruiting is the production of a small amount of fresh fruit for family use late in the season, but this trial seems to show little prospect of inducing tardy fruiting by means of encouraging a late seasonal growth.

HARVESTING AND MARKETING

Red raspberries ought, if possible, to be picked every other day, for they deteriorate rapidly when once they are ripe, a process which is not prevented by their being allowed to hang on the bushes. Moreover, since they are a soft, difficult berry to ship, at best, it is advisable to start them on the way at the earliest possible moment. The longer they remain after ripening, the softer, duller in color and poorer in quality they become. They are best marketed in pint baskets. These are oblong in shape, and the size is such that an ordinary bushel crate will just hold sixty of them. The smaller quantity in each basket enables them to carry much better than when marketed in quarts. Care

should be taken never to pick the fruit when wet, and to keep it in a cool, well ventilated place until sent to market. A home market is by far the most desirable. For evaporating, berries may be batted off (Fig. 13; and see discussion in next chapter).

USES

The red raspberry is essentially a fruit to be sold on the market fresh, unless the grower chances to be

Fig. 13. Berry harvester. (See page 74.)

located near a canning factory. There is no difficulty whatever in evaporating it, but the shrinkage is so great that it is hard to secure a price for the dried product which is high enough to yield a fair price per quart of fresh fruit. A heaping quart basketful of fruit will weigh about four ounces when dried, varying somewhat with seasons and other conditions, so that one cannot expect over seven or eight pounds of dried

fruit per bushel of green fruit. Moreover, the true reds dry to a dull, unattractive color, which must ever prove a hindrance to their sale. It is difficult to get people to pay a satisfactory price for a thing which does not look well. The Shaffer is one of the best varieties for evaporating purposes. It is a prolific, often an enormous yielder. It is intermediate between the red and black, rich and of good flavor. Moreover, when dried it has a much more attractive appearance than the Cuthbert. There is, therefore, reason to suppose that the cultivation of this for evaporating purposes might pay, though probably not so well as the cultivation of black-caps. Certain it is that, whatever the variety, if the market should become glutted at any time during the season, and facilities for evaporating are at hand, it should be done by all means, rather than let them waste. The dried fruit is sure to find a market, and probably at a price which will yield a fair return for the crop. If the fresh fruit will sell at reasonable prices the question of evaporating need never be considered. The conditions hardly warrant planting them for evaporating alone; certainly none of the true reds, though Shaffer may pay.

DURATION OF PLANTATIONS

Like the blackberries, red raspberries can be made to continue producing from the same plantation for a number of years, though it is doubtful whether it ever pays to do this. There are so many causes tending to weaken the plants, and render them less productive

as they grow older, such as disease, reduced fertility of the soil, over-crowding, etc., that it is almost impossible for them to yield a good return after having borne two or three crops. Especially are the various diseases which affect cultivated crops coming to be such an important factor that it is necessary to adopt every feasible precaution to prevent their ravages. Not only are the older plantations likely to become diseased so as to greatly lessen their own productiveness, but at the same time they become most effective breeding grounds for the spread of these diseases, and injurious insects as well, to new and healthier fields.

Moreover, the continuous production of suckers is likely to fill the rows or hills so full of plants in a few years that they are of necessity small and weak unless vigorously thinned out. Even that does not fully overcome the difficulty. The rows are almost sure to become filled with weeds, and grass as well, and cannot be kept clean without too great expense. It is on the whole, therefore, better to get three or four good crops, then plow up the field and depend upon another plantation ready for the purpose. The fruit will be larger, hence more marketable, and the results more satisfactory in every way.

Although persistent, it is not very difficult to rid a field of the plants by the same treatment recommended for the blackberry. They may continue to appear for some time, but they are not so strong but that they may be easily controlled in whatever way the land is used afterward.

HARDINESS

As a rule the reds do not equal the black-caps in hardiness, though some varieties are seldom injured in favorable locations in the middle latitude of the United States. It seems probable that the lack of hardiness as frequently comes from want of ability in the leaves to endure the hot suns of summer as from lack of ability in the canes to endure the cold of winter. If by any means the function of the foliage during the growing season becomes impaired, the vitality of the plant is lessened, and it goes into winter poorly prepared to meet the conditions laid upon it during that period. Hence it seems but reasonable that lack of hardiness or winter-killing may result from insect or fungous injury inflicted during summer, as well as from unfavorable climatic conditions. It is an interesting fact that small, late-growing canes generally stand the winter better than the more vigorous ones of the whole season's growth. Cuthbert canes produced at the Cornell gardens, after cutting away all young canes July 6, 1892, came through the winter in better condition than the earlier, undisturbed canes in the other part of the same row. These later canes were alive to the tip in spring, and at the time the leaves were opening they were more uniformly green and farther advanced than the others. They produced fine fruit, but since they are smaller than canes of the full season's growth, the yield might be less. One Iowa grower reports that in two seasons' trial, blackberry canes produced after pulling up all young shoots about the last of

June, were loaded with fine berries, while older canes alongside had but few. Although such canes are later it does not necessarily follow that they are immature. Starting later, when the conditions do not favor so vigorous a growth, it is altogether probable that the wood is firmer and its vitality greater at the beginning of winter than that of the earlier canes.

YIELDS

The yield of red raspberries is less, as a rule, than that of any other member of the genus, unless it be the dewberries, the yield of which is more or less a question of locality. The average yield of reds, as derived from the replies of fifty-six growers, is about sixty-nine bushels per acre. A few growers place the estimated yield higher than that of black-caps, but this is exceptional. Moreover, this smaller yield is distributed over a longer ripening period, and is for that reason more expensive to gather and market, so that the reds ought always to bring one or two cents more per quart than the black-caps, in order to prove equally profitable. There can be no doubt that the average yield can be largely increased by good care and by abandoning the plantations sooner, for it is the old fields which give the poor returns.

NORMAL PROFITS

Red raspberries are nearly always in good demand. The grower who lives near a small town, where there is not too much competition, and who can depend

upon getting from eight to twelve cents a quart for his crop, will have no trouble in making red raspberries pay. There is generally less likelihood of glutting the markets with reds than with blacks, but their smaller yield and poorer shipping qualities tend to render their profitableness uncertain if the vicissitudes of a city market at any distance from home must be depended on.

The entire cost of cultivation, rent of land, fertilizers, etc., need never exceed fifty dollars per acre. The cost of picking and marketing will range from two to four cents per quart, usually, so that if the crop can be made to net five cents a quart after deducting cost of picking and marketing, there will still be left a profit of about sixty dollars per acre, with the average yield mentioned above. It will be readily seen that this is a very conservative estimate, and by no means equal to the results often obtained.

NOTE ON THE HYBRID REDS

There are really two classes of plants embraced in this hybrid group. One of these propagates naturally almost wholly by tips, like the black-caps. This is the true *Rubus neglectus*, or Purple Cane type, and it is to this class that the old Purple Cane, Shaffer, Columbian and others belong. These demand the same methods of planting, pruning and care as that given to the black-caps. The other class propagates chiefly by suckers, but can be made to root from the tips with proper care. These are essentially red raspber-

ries in character, and demand the same care and treatment as red raspberries. Indeed, some of them approach so closely to red raspberries that a doubt arises as to whether they ought not to be classed with the reds, instead of with *Rubus neglectus*. To this class belong Philadelphia, Reliance and a few others. Caroline is a pinkish yellow berry, belonging to this category, and thought to be a seedling of Brincklé's Orange, fertilized by some cap variety.

Many of these are excellent for the home garden, owing to their great productiveness and rich flavor. The great objection to them as a market fruit is their dull, unattractive color and their poor carrying quality. Some persons who cultivate the Shaffer for market overcome this difficulty, in part, by picking them before they are fully ripe and while they are yet red. At this time they carry better and look better in market. In a home market, however, there is but little difficulty in selling the Shaffer when fully ripe, dark as it is, if people come to know what it is and have once tried it. It is one of the best raspberries grown for canning purposes. It combines something of the flavor of both the reds and blacks, and the color after cooking is no longer unattractive.

CHAPTER III

BLACK RASPBERRIES

The black-cap raspberries are more homogeneous in character than the red varieties. They are all true American fruits, being developments from the common wild black raspberries.

SOIL FOR BLACK-CAPS

Black-caps succeed on a wide range of soils, but thrive best on one which is rich, deep, moist and well drained. Sandy or clay loams are preferable. A location where water stands for any length of time is never permissible. Let the grower who has ever gathered wild black raspberries recall how luxuriantly they grow in newly-cleared land, abounding in leaf-mold, and take a lesson therefrom. Virgin soil filled with leaf-mold is no longer available, but it is possible to greatly add to the humus in the soil which is to be used, thereby approximating the conditions found in the forest clearing. It should not be forgotten that humus greatly increases the drought-resisting quality of soils, a point of the utmost importance in berry-growing. A soil rich in humus will do much toward supplying the elements of plant-food needed, by rendering available plant-food which is already in the soil and preventing its loss. In Kansas, the uplands

having a black loam with clay subsoil, are reported to give the best results. Stony soils may yield just as good crops, but are even more expensive to work than when used for crops for which the ground is plowed every year.

LOCATION

Stronger plants and larger fruit can be obtained from the strong, moist soils of valleys and bottom-lands. Such fruit is not equal in flavor, however, to that of the higher lands, and the plants are more likely to be injured by the winters or by late spring frosts. If close to a large body of water, the latter objection is largely obviated. As is true with all the other berries, a cool, northern exposure, which will suffer as little as possible from drought and hot suns, is to be preferred, though by no means necessary. A closely bounded basin is always to be avoided, for in such a situation the extremes of temperature are likely to be much greater. In the bright days of summer the sun may pour its rays into such a place until the atmosphere, owing to lack of circulation, becomes abnormally hot. At night, on the other hand, the cold air will settle into such a position, greatly increasing the danger of untimely frosts, or of injury from excessive cold. A steep hillside is always objectionable, both from the difficulty of cultivation and from the loss of fertility and danger to the plants which may come from excessive washing of the soil.

FERTILIZERS

Stable-manure is by far the most popular fertilizer among growers. It is particularly applicable to black-caps, since they demand heavier feeding than red raspberries or blackberries and are less likely to respond to an over-supply by making too vigorous growth, with consequent lack of hardiness and diminished fruitfulness. In replies to questions sent to growers, asking what fertilizer had been found most satisfactory, stable-manure was mentioned forty-four times. Wood-ashes ranked next, being mentioned twenty-four times. This strong preponderance of opinion in favor of stable-manure may indicate that it possesses greater value than its comparative merits warrant. This is the one material which nearly every grower is likely to have used, and when properly applied it is sure to give satisfaction. It does not follow that its application is always the most economical and satisfactory thing to do.

One wide-awake grower replied that a Planet Jr. cultivator proved the best fertilizer with him. This is simply a modified version of the old adage that "tillage is manure," the full truth of which most of us have not yet come to appreciate. Such plants as raspberries do not make heavy drafts upon the soil. If therefore the physical conditions of the soil can be kept right and the chemical activities can be augmented, enough plant-food can be unlocked from most soils to supply their needs. Tillage does both of these and also assists to conserve moisture, without which no plant-food can be available, since it can only be used by the plant when in solution.

The quality of ordinary stable-manure is very uncertain, owing to differences in methods of feeding and in treatment which the manure receives after it is made. It commonly contains an excess of nitrogen. This, though by far the most expensive element of plant fertility, and one easily lost by leaching and evaporation, is required in only limited quantities in the production of fruit. The chances are, therefore, that in the use of large quantities of stable-manure this expensive element is wasted. An excess of organic nitrogen may also help to deplete the soil of potash. When changed to nitric acid it combines with potash and other bases which leach away if not taken up by plants, thus depleting the soil of basic ingredients. The use of less manure, supplemented with chemicals containing phosphoric acid and potash, is often wiser.

According to the analysis of raspberries published from Washington* a crop of one hundred bushels of raspberries would remove only about six pounds of nitrogen, twenty pounds of phosphoric acid and fourteen pounds of potash from the soil. This being true, the importance of fertilizers may be easily overestimated. Fifty pounds of nitrate of soda or slightly more of dried blood, one hundred and fifty pounds of acid phosphate and fifty pounds of muriate of potash would more than supply this need. The unavoidable losses in the soil make it necessary to furnish more than the plants take away; yet this may serve as a suggestion regarding the possible demands. The individual qualities of the

*Year-Book, Dept. of Agr., 1895: 568.

soil may modify the validity of calculations of this sort, since soils differ so much.

One factor in soil-fertility is not supplied by chemicals. That factor is humus, a more important one than the others. In this stable-manure has the advantage, but the same results may be obtained by the judicious use of green-crops before planting and of cover-crops afterward.

PROPAGATION

There is practically but one way of propagating black-caps, and that is by means of tips. Plants can be grown from root cuttings or by burying the entire cane and cutting it in pieces after roots are thrown out, but these methods are so seldom used that there is little need of taking them into consideration. These tips take root naturally, unaided, in sod ground, for they thread their way amongst the grass roots, and are thus held in place until established. In cultivated ground they are blown about by the wind, and do not have an opportunity of becoming fastened in the soil. It is necessary, therefore, to put the tips down and cover them, in order to secure any considerable number of plants. This may be done with a hoe, spade or any other convenient tool. It is better to point the tip well downward, so that the end is the deepest part when covered. This will produce a plant of much better shape than if the tip is put in nearly horizontal and covered for a considerable length.

A tool hung somewhat like an adze, but with a

narrower blade, about as heavy as a good-sized hammer, and which can be readily swung in one hand, will prove convenient. Such a device is largely used in planting strawberries by L. J. Farmer, of Pulaski, N. Y., who was the first, so far as I know, to suggest it. Perhaps an equally serviceable implement might be made on the plan of a spade, using a shovel or spade handle, which could be conveniently grasped in the hand, combined with a strong, heavy blade about two inches wide and six or eight inches long. This could be easily thrust into the soil with one hand, moved to one side, while the tip is inserted, then removed, and thrust in again at the side to firm the soil against the tip. A narrow transplanting trowel, like those used by nurserymen in setting root grafts, would answer equally well, except for the shortness of the handle, and consequent stooping required. A cross-bar on which to put the foot, if necessary in hard ground, is an advantage. Either of the tools mentioned can be readily made with the aid of a blacksmith.

The tips should not be covered until they begin to thicken and assume a leafless "snake-like" appearance, which will generally be from the middle of August on.

It is always desirable to propagate plants from young plantations, if possible. They not only root more readily and freely when young, but more healthy and vigorous plants are produced, with less likelihood of the transmission of disease. There are those who argue that since black-caps have always been propagated largely from bearing plantations without deterioration, there is no ground for believing that better plants

are produced from young plantations. This is hardly sufficient evidence for the statement, for there is no doubt that varieties do deteriorate in cultivation, and since this mode of propagation is nothing more than a sub-division of the same individual, the young plant cannot fail to carry with it to a large degree the character of the old one. Propagating from old plantations is especially objectionable if the plants are affected with anthracnose, or any other fungous disease, as so many old plantations are likely to be.

PLANTING

Spring planting is always to be preferred for black-caps; yet, if for any reason it is desirable to secure the plants in the fall, a very good method is to plant them in shallow furrows and mulch well through the winter, leaving them in this position until the young shoots have made a growth of several inches in spring; then set in their permanent place. This insures the weeding out of any poor plants and secures a perfect stand in the field. Plant deep; careful growers who have given attention to this point have satisfied themselves that 3 to 4 inches is none too deep to give best results. The plants should be set in the bottom of the furrow and covered lightly at first, gradually filling up the furrow as growth progresses. Plants thus set appear to stand drought better, and there is less trouble with the canes blowing down than when planted shallow. In the beginning they may make a less even and vigorous start

than those planted shallower, for the bottom of a deep furrow in early spring is of necessity a less favorable position for the growth of a young and tender plant than one nearer the level of the surface. Deep planting will not prove satisfactory where the subsoil is high and hard.

One point in connection with planting which should not be neglected is pruning back the plants closely when set. Experienced growers rarely neglect this, but in home gardens, at least, plants are often seen where long canes are left, apparently with the idea of getting fruit at once. Any fruit obtained the first year, however, is at the expense of the growth and vitality of the plant, and will be charged up against ensuing crops at much more than compound interest. Plants which are not cut back nearly to the crown when set do not readily throw up canes from the root, but branch out from the old stalk. Especial care should be taken to cut away the whole of the old canes if they show any spots of anthracnose. There is every advantage in keeping rid of such diseases and enemies just as far as possible, rather than allowing them to first become destructive and then attempting to fight them. If a large proportion of these tips have the anthracnose spots when planted, the disease is transferred and reset with as much certainty and under as favorable conditions for growth as are the plants themselves, unless removed and destroyed. Simply to cut off the tips and leave them lying on the ground where the new planting is done, is to miss entirely the end sought. These fungi are plants

just as truly as are the ones upon which they live, and their seeds (spores) are just as certain to germinate and grow if given the proper conditions.

If black-cap raspberries are to be planted in rows, three feet in the row, with rows six feet apart, will be found satisfactory distances. Some prefer rows seven feet apart, and for very strong-growing varieties this is no doubt better. If in hills, they should be not less than five feet apart each way, which may do for weak and slender-growing varieties, but as a rule six feet is much better. Black-caps are more easily kept in good condition in rows than red raspberries and blackberries, but there is the intermediate space between the plants to be kept clean by hand, so that it is unquestionably more expensive to care for an acre thus planted than when in hills far enough apart to admit of horse cultivation both ways. Larger and finer fruit can also be obtained from hills farther apart, with thorough cultivation on all sides. The only question is the yield, and those who have tried it most thoroughly are most confident that the yield is fully as good in hills as in rows.

TILLAGE

The importance of frequent, thorough cultivation has been so strongly urged in connection with each of the other fruits that a repetition is uncalled for here, although just as applicable to this as to all the others. Since there are no suckers to be cut out in black-caps, it matters less what the style of the cultivator is, if it

only loosens the ground thoroughly and leaves it fine and mellow. Some growers use a plow at the first cultivation, and perhaps once later in the season. On the whole, this is not to be recommended. It not only disturbs and injures the roots, but it leaves the ground in undesirable shape. If the furrows are turned from the rows with a ridge in the center, the two furrows next the bushes leave the roots more or less exposed, which is undesirable. If the furrows are turned toward the rows this leaves a ridge, with more or less of a harbor for insects about the plants where the furrows are thrown together. If cultivation is begun promptly in spring, before the ground gets hardened, there is no necessity for plowing, for the soil will work up readily with any good cultivator. This keeps the ground in much better shape, both for work among the bushes, and for the satisfactory growth of the bushes themselves.

PRUNING

Young black raspberry canes should be cut back to cause them to branch and become as nearly self-supporting as possible. One point, already mentioned, should be again emphasized, and that is that the young shoots should be nipped back low, when they reach the desired height, not allowing them to get considerably higher and then cutting back to the height required. If pinched low, the plant will at once throw out strong and vigorous branches near the ground, making a well-balanced, self-supporting bush. On the other hand, if it is allowed to grow higher and is then cut back, only

weak buds are left, and the result is that they do not develop so rapidly; only three or four of the upper ones start at all, producing a topheavy and unsatisfactory plant. Sheep shears are very convenient for this summer pruning, or it may be quickly done by merely pinching out the tip with the thumb and finger. In a young plantation, where the old canes do not interfere, a large knife, sharpened on both edges, is probably more convenient than either. With older bushes, the cutting should be done at a point lower than the top of the old bushes, so that a knife is not likely to work so well. With a knife in one hand and shears in the other, the workman can meet any condition quickly. Theoretically, a smooth, slanting cut would appear to be better than breaking them off with the thumb and finger, leaving an irregular, ragged end. An experiment to test this, however, proved that it makes no difference, for the canes nearly always die back to the first bud in either case.

One clipping is sufficient, although it is necessary to go over the plantation two or three times, for the shoots do not all reach the desired height at once. Eighteen to twenty-four inches is about the height at which to clip the canes, if done when they reach that height. If allowed to grow too high before clipping, they should not be cut back quite so close. Clipping the laterals after they have grown twelve or fifteen inches, to make them branch again, has been sometimes recommended, but there is little, if any, advantage in it, while it makes an added expense in summer, and also in the spring pruning. It also results in produc-

ing a mass of small and poorly-developed laterals, many of which are winter-killed. It is much better after pinching the main cane to let them alone until the following spring, when they should be cut back to twelve to eighteen inches in length.

Now and then a grower is heard from who deprecates all pruning as contrary to nature, and, therefore, argues that plants should be allowed to grow entirely at their own sweet will. One recent writer in this line brings forth, in proof of his argument, the statement that he never takes less than ten crops of fruit from a plantation, and even then the canes are stronger than those of many five-year-old plantations he has seen. This is, no doubt, perfectly true, for a little later he states that he would be satisfied with a yield much below that given as the average estimate of a large number of growers. A machine which does only half work ought to last longer, and so with a raspberry plant. But why continue to care for a plantation year after year by a system of culture which returns a yield much below that easily obtained, simply because the plants last longer thereby? Why not rather force the plants to do their best, and when they fail let them go, thereby securing better fruits, better yields, and consequently better profits?

Not more than five young canes to the hill should be left to develop, and three is probably even better. Indeed, were it not for the liability of accidents to a single cane, it is quite possible that we might just as well get all our fruit from one, if given the whole strength of the root throughout the season. Samuel

Miller, of Missouri, reports repeatedly getting two quarts in a season from single canes.

When the fruit has been gathered, cut out all old canes, gather and burn them, to destroy all insects and fungi harboring thereon. The work is easier done at that time than at any other, and it gives a good opportunity for thoroughly cultivating and cleaning out the plantation. The argument that the old canes serve to protect the younger ones during the winter, and, therefore, should be left till spring, has little weight. Whatever protection there may be is undoubtedly fully offset by the injuries due to whipping together and consequent wounding in windy weather.

When it has been decided to discontinue a plantation, it will be found an advantage to the bearing canes to go through the field and pull or break away all the young shoots about blossoming time. This has a slight tendency to hasten the ripening, and may enable the plants to carry the fruit through in better shape and increase the yield considerably, especially in a dry season, when every drop of water that can possibly be obtained from the soil is needed by the fruit itself.

There is always a temptation to leave too much wood and allow the plants to overbear the first year after setting. They are but partially developed at that time, and should only be allowed to produce a partial crop. The canes are usually long and straggling, and need to be severely cut back. If left long they may produce a comparatively heavy crop, but it

will always be at the expense of vigor and future productiveness. In fact, a plantation may be practically ruined by this first injudicious treatment.

HARVESTING

Gathering the fruit is one of the most troublesome details connected with berry-growing of all kinds, and the man who does not live close to a town where plenty of pickers can be readily had is practically debarred from entering any line of it where hand-picking must be employed. Formerly it was the same, whether growing the fruit to be sold fresh in the market, or for drying. But the advent of the harvester has made it possible to grow and evaporate raspberries without the annoyance of assuming command of a small army of pickers. This opens the way to any farmer, for taking up this industry, no matter how remote his farm may be from towns or railways, and it is in this fact alone that the chief value of the method lies, for many growers who are so situated that they can easily get pickers in abundance still prefer to have the fruit picked by hand.

This harvester is a simple affair (Fig. 13, page 54), consisting of a canvas tray some three feet square, there being only enough wood about it to form a frame-work and enable it to be moved about. Under the corner which rests on the ground, there is a sort of shoe of wood, enabling it to be slid along from bush to bush easily. In one hand the operator carries a large wire hook, with which the bushes are drawn over the canvas,

or lifted up if too low down and in the way. In the other hand is a bat, resembling a lawn-tennis racket, with which he knocks off the ripe berries. This bat is merely a canvas-covered loop of heavy wire fastened in a convenient handle. In place of this, some use a wooden paddle, at the risk of bruising the fruit unnecessarily. In gathering by this method, the berries are allowed to become very ripe, and the plantation is gone over but two or three times in a season. Many dry leaves, some stems and a few green berries are knocked off with the fruit, but the leaves are no disadvantage, for they help to absorb moisture before and after drying, and may aid in preventing mold if the fruit has to stand for some time before going to the evaporator. The leaves are quickly taken out by running the fruit through a fanning mill after it is dried. Some growers fan them out before drying, but this has the disadvantage of bruising and crushing more berries. The berries are usually allowed to stand in the field in boxes for a time after gathering, and any insects which may have fallen in are likely to crawl out and disappear.

Growers who have had much experience say that a man will average eight to ten bushels a day with the harvester, although much more can be gathered in the best picking. On one farm visited, two men and two girls had gathered thirty-one bushels the day previous in ordinary picking, and one of the men had been in the field but part of the time. This shows the first cost of gathering to be less than half a cent per quart. Running them through the fanning mill costs but a

trifle ; then before marketing they are picked over by hand to remove stems, green berries and other litter. This does not cost over one cent a pound and is sometimes paid for by the pound at that rate, so that the whole cost may be placed at one cent a quart, as against two cents usually paid for hand-picking. There are those, however, who think that in the end there is not much difference in the expense, whether gathered with the harvester or picked by hand. Growers who have had experience with both methods express the opinion that harvesting yields a better quality of dried fruit than hand-picking, for the reason that, if picked by hand, they cannot afford to look them over again after drying, and so they do not go to market in as clean and nice condition as those which come from the harvester.

Some extensive and general fruit-growers find it inconvenient to attend to the matter of looking over the dried product at the same time that other fruits, which follow on after the raspberries, are claiming their attention, and for that reason prefer to pick a large part of the crop by hand and market it fresh, if they can get pickers conveniently. In that case, they find the harvester a great convenience to finish up the last of the crop. Every grower knows how much dissatisfaction occurs in keeping the pickers at their work after the berries begin to get thin. With the harvester, the late berries can all be gathered at one time with a great deal of satisfaction to all concerned. This plan is also available for those who sell their fruit fresh. The last of the crop can be gathered

and dried, thus proving a relief to the market and to the patience of the grower and pickers. This method of harvesting was invented and introduced by Jewett Benedict, of Dundee, N. Y., and is extensively used by the berry growers of that region.

METHODS OF DRYING

Drying Out of Doors.—Various methods of drying are employed, the simplest of which is to dry on boards in the sun. This usually takes from three to five days, and the picture shows the way in which it is ordinarily done. Platforms or trays about twelve feet long and

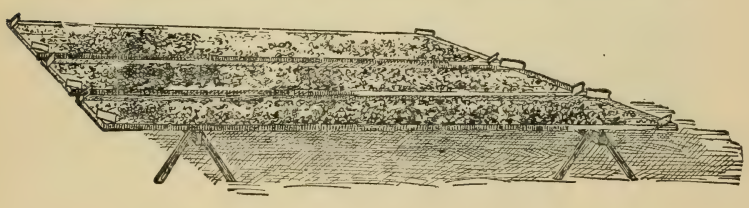

Fig. 14. Drying berries out of doors.

three to four feet wide are made of matched boards. A narrow strip is nailed around the edge of each tray to prevent the berries from rolling off. The trays rest upon long horses made of scantling, to hold them at a convenient height from the ground. A little block is tacked across each corner of the trays, so that at night or in case of a shower they can be stacked up on top of each other and covered with boards or canvas. This is of necessity a slow way of drying, and the cost of lumber for trays to handle a large crop would be an

item of considerable expense. One of the chief objections to the method is the large number of flies which it calls to the scene, the attentions of which do not tend to render the fruit more appetizing. Indeed, those who are familiar with the method are often prejudiced against all dried raspberries. Sun-dried

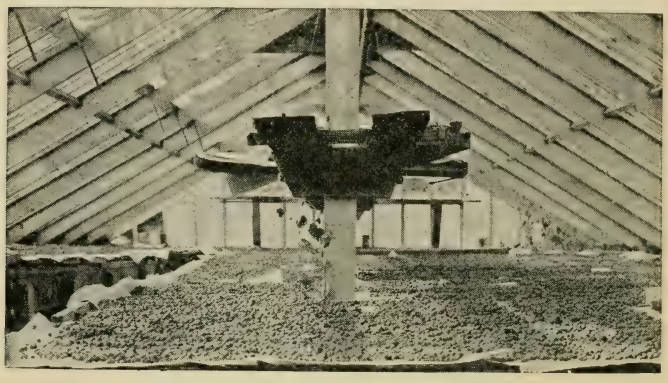

Fig. 15. Drying berries in a forcing-house.

raspberries are usually quoted about one cent a pound below evaporated berries, but consumers can never be sure which they are getting. It is possible that these trays might be covered with fly netting, but this would increase the time needed for drying, and would also not wholly obviate the difficulty, unless the netting was held above the fruit, for if laid directly upon it the netting would only aid the flies. A single attempt to dry blackberries under glass when covered with netting proved such a failure, inducing so much more molding than without the netting, that there is

much doubt as to whether it would prove satisfactory.

Drying Under Glass.—Another method employed by those who have greenhouses for the winter forcing of vegetables, is to utilize the space under glass during the berry season for this purpose. Fig. 15 is reproduced from a photograph taken in a forcing-house on the farm of J. W. Corbett, near Watkins, N. Y., in the summer of 1892, and is an excellent illustration of this plan of drying. In this situation the berries usually dry in about three days in bright, warm weather, and are, of course, less liable to injury from storms than outside. The plan is, however, open to the same objection cited in regard to outdoor drying as to flies. It is advisable to have as much air passing through the house as possible, hence the door and ventilators are left open, but by using screen doors and protecting the ventilators with netting, most of the flies might be excluded.

Drying with Evaporators.—For a business of any considerable extent, by far the best way of drying is by means of some good evaporator. There are many different makes of these in market, most of which do good work. The hot air machines were first introduced, and are still very largely in use. Later steam came to be used, and many of the large machines are now fitted for steam heating. These being newer, are said to be superior, and if they can be operated in connection with a power plant where the exhaust steam can be utilized, they undoubtedly possess an advantage. One of the points of superiority for steam

is the less liability to scorching. From several years' experience with a large hot air machine, however, I do not think this point has much weight, for with any reasonable care no fruit is scorched by either method. The temperature of the stack should run from 160° to 180° Fahrenheit. One very essential point in any machine, whatever the make, is a strong draft of air through the stack. The amount of vapor given off by a machine full of hot, green fruit is very great, and every possible facility is needed for carrying it away. The difference in the amount of fruit which can be dried in a damp, cloudy day and in a bright, clear day when the wind is in the northwest, emphasizes this point very strongly. In some of the large horizontal machines, it is necessary to secure this draft by means of large fans revolved by steam power.

With many of the machines in use, the fruit is put in at the lower end; the trays follow one after the other, and can only be taken out at the opposite end, necessitating a two-story building if the evaporator has an upright stack. This plan has the advantage of utilizing all the space in the stack, but, on the other hand, it possesses some decided disadvantages. All the trays must be carried down stairs or let down through the floor each time they are used, or carried back the length of the evaporator if it is a horizontal machine. Moreover, all the work must be timed and a tray put in just so often, otherwise the fruit may reach the top too green, and all operations must stop and wait till it is dry, or that on two or three trays must be put together and be sent

through the whole length again, with the chances that it will then be dried altogether too much. If put in too slow, or if the fruit is not coming in quite fast enough to keep the business going, it may be too dry when it reaches the top the first time. This is an especially disadvantageous point if it happens to be necessary to dry different kinds of fruit which do not require the same length of time in the evaporator. In a machine in which the trays are carried on hangers attached to an endless chain subject to the control of the operator, all this difficulty is obviated. The trays are put in and taken out at the same place, and any tray can be brought around to the door and examined as often as desired, and taken out when ready. In putting in fruit, one tray only is usually placed on a hanger at a time, so that in the natural course of the work every tray comes under the eye of the "stackman" as often as it needs to be examined.

I have no accurate figures as to the cost of evaporating, but it can be inferred approximately from the price which operators charge other parties for doing the work. In some sections this charge is one cent per quart, in others as low as two cents per pound. Two and a half cents per pound appears to be a fair price for drying and cleaning, and as the evaporator owner, of course, expects to make some profit, the actual cost must be somewhat below this. The yield varies somewhat in different years, so that one cent a quart may mean from three to four cents a pound.

The berries are taken from the machine when still so soft and juicy that to an inexperienced person it does

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not seem that they could possibly be kept from spoiling. They are placed on the floor or in bins in a curing room somewhere about the building, and are shoveled over every day for about three weeks. By this time any excessive moisture will have evaporated, and the balance become evenly distributed throughout the whole mass, which is by that treatment rendered soft and spongy so that it can be readily pressed into the boxes for shipping, a thing which could not be done if they were dried down hard at first. The fruit is of much better quality also, when cured in this way, for it soaks out more readily, making a better product in every way.

MARKETING

When sold fresh, black raspberries are usually marketed in the ordinary quart baskets. They hold up fairly well in these, and being one of the cheaper berries, this package meets the demands of most markets well. The berries would be more attractive and handle better in pints, if the market would warrant it. This might be found advisable for the first of the season in cases where a satisfactory price can still be maintained.

The dried fruit is marketed in boxes holding fifty pounds, or in barrels which hold about one hundred and twenty-five pounds. These boxes can be gotten up at home, but it will generally be found cheaper to buy them directly from box manufacturers. They can be had at the same price either in the knock-down or put together. The freight rates are higher in the latter case, so that the choice will depend somewhat upon location.

It is essential that they be well built to prevent the ingress of insects after they are filled. They are lined with paper before the fruit is put in, in such a way that it will fold back neatly from the top when opened.

The fruit is usually sold in large lots through commission men, but may sometimes go direct to wholesalers and dealers with advantage.

THE EVAPORATED RASPBERRY INDUSTRY

Bailey has given an account of the evaporated raspberry industry in western New York, in Bulletin 100 of the Cornell Experiment Station. With permission of the author, his account of the history of this industry, together with his descriptions of the styles of evaporators in most common use, is incorporated here:*

"Western New York leads the world in the production of dried raspberries. Something like 1,500 tons of the evaporated product are marketed each year. Of this, about 1,000 tons are produced in Wayne county, in which the towns of Williamson and Sodus, which produce nearly or quite half of the amount, are the most important centers. Marion, in Wayne county, is also a heavy producer of dried berries. Outside of Wayne county, the region tributary to Dundee, Yates county, is the most important center of the dried raspberry industry. The product sold at Dundee is probably upwards of one hundred and fifty tons each year. Many berries are also dried south and east of Dundee, in Schuyler county, round about Watkins. In Niagara county the industry has become established at Somerset, where about twenty tons are produced each year. There are also many persons who dry raspberries in other parts of the fruit regions of western New York, and the industry is gradually enlarging as people come to learn

*Consult, also, Corbett, Bull. 48, W. Va. Exp. Sta.

that it affords a means of making the grower independent of the open market.

"Yet the visitor might enquire in vain for dried raspberries in many of the stores in this western New York country. In other words, the product is not largely consumed in this state. It is used mostly west and northwest of Chicago. Probably four-fifths of the product is consumed in lumber and mining camps, and on the plains, where fresh fruit is scarce. None of it, so far as I know, is exported, and there is very little, if any, commercial dried product in Europe. C. H. Perkins & Co., Newark, N. Y., 'tried the experiment of exporting some of these goods to France several years ago, but shipped only two or three cases of them. The goods are still on hand in France, with no disposition to take them at any price.' Raspberries are dried to an important extent in southern Illinois and in Michigan, and lately also in Arkansas. These dried raspberries have as much merit in cookery as the fresh berries, and they are used in the same manner in sauces and pies.

"Wayne county is the home of commercial fruit evaporation. In the apple-growing communities, nearly every farm has an evaporator of one kind or another. It is said that there are 2,200* evaporators in the county, and this estimate is probably none too high. All this industry is the product of the last twenty-five years. The beginning of the industry seems to have been the introduction of a little machine from Ohio (probably the D. Lippy fruit drier.—*Rept. Com. Patents, 1865, iii. 378*), by A. D. Shepley and George Edwards in 1867. The right to use this evaporator was purchased by Mason L. Rogers, near Williamson, and the following year, 1868, he planted five acres of black raspberries, with the expectation of evaporating the fruit—or drying it, as the operation was then called,—and this began the evaporated raspberry industry. Mr. Rogers made some improvements on the machine, and about 1875 H. Topping, of Marion, took up its manufacture, making alterations from time to time. The direct descendant of this old machine is the Topping portable evapora-

*Statement of Charles Mills, *Country Gentleman*, April 18, 1895, p. 308.

tor of the present day (Fig. 18), which is deservedly popular with beginners and for family use. The original machine, as sold by Shepley & Edwards, was made in two sizes, the smaller capable of drying three bushels of apples in eight to ten hours, and the larger with a capacity of five bushels! This small beginning seems incredible when one compares it with the great establishments of this time, in which scores of hands are employed and thousands of bushels are consumed annually.

"The beginning of the modern industry, however, and the introduction of the word 'evaporated' to designate the product, date from 1870, when Charles Alden, of Newburgh, New York, patented his tower evaporator. The decade from 1870 to 1880 was prolific in the invention of capacious evaporators and accessories, some of which determined the course of the evaporating industry. The Williams evaporator, invented by John Williams, South Haven, Michigan, was patented in 1873. This was soon followed by the Culver machine, which was patented after the death of its inventor (Stephen Culver, Newark, N. Y.,) in 1882, by his administrator, Harlan P. Van Dusen, also of Newark. (Filed Sept. 26, 1880; patented Oct. 3, 1882.—See *U. S. Gazette of Patents*, xxii. 1171.) As early as 1876, Mason L. Rogers 'built and equipped a Culver evaporator,' as his son writes me. John W. Cassidy patented his device for lifting trays in 1876. Cassidy was a resident of Newark, New York, but moved to Petaluma, California, where he resided when he took out his patents. His device, combined with Culver's, is the leading lifting arrangement now in use in western New York. Cassidy took out another patent in 1880 for a device to dry fruit by exposing it alternately to a vacuum or partial vacuum, and an inrush of dehydrated air, but this system is probably unknown in this state. It now needed only the advent of a bleaching device and improved machines for paring and ringing the fruit, to establish the evaporating business upon an enduring basis; but as these devices are not used in the making of evaporated raspberries, they need not be further discussed in this paper.

"1. *The Kiln Drier.*—The evaporators which are used in western New York may be arranged in five categories,—the kilns, hori-

zontal evaporators, towers, steam tray-evaporators, and air-blast evaporators. The kiln is nothing more than a slatted floor, underneath which hot air or smoke pipes or steam pipes are conducted. The slats are hard-wood, sawed about seven-eighths inch wide on top and a half-inch wide on the bottom, and they are laid so that a crack one-fourth inch wide is left on the floor. As the crack is wider below, it does not clog and fill up. The kiln is used for curing hops, for drying the skins and cores of apples, and occasionally for drying raspberries, and even for the making of 'white stock,' that is, the commercial grade of sliced evaporated apples. The smokestack from the furnace usually runs through the room, and beneath the floor, but not shown in the picture, is one circuit of a stovepipe carrying hot air. In some floors the slats are close enough together to allow raspberries to be spread upon it; but floors which are built for hops or apples are generally covered with muslin when raspberries are to be dried. Kilns are generally less efficient in the production of a first quality of dried fruit than the other styles of evaporators, because the fruit is not so completely under the control of the operator. The fruit must be shoveled over from time to time to insure a uniform product. This handling is itself a menace to good fruit, and when there is any quantity of fruit on the floor it cannot all be dried equally. That which is dried enough is generally obliged to wait until the least dried portion is perfected. Yet there are instances in which the operator exercises sufficient care to turn out a product which is indistinguishable from the tower-dried fruit. The particular merit of the kiln evaporator is its cheapness.

"2. *The Horizontal Drier.*—The horizontal evaporators, in which the pans or trays of fruit are moved horizontally or obliquely across the heating surface, are little used in western New York, and are therefore not discussed in this paper.

"3. *The Tower Drier.*—The tower or stack evaporators, in various forms, far outnumber other appliances in this state. The stack is a chimney-like structure, of wood or brick, resting in the basement of the building and extending up through the building and projecting above the roof. A coal or wood furnace—preferably the former—is placed in its base, and air which is drawn in

from the basement passes over the heated surfaces and ascends through the shaft, drying the fruit as it rises and carrying the vapors into the atmosphere. The fruit is placed in the stack on the first floor, that is, the floor above the basement. It is spread on trays, and as new trays are put in, those which were first inserted are elevated in the tower. The trays finally reach the second story, by which time the fruit should be finished, and the trays are removed and emptied and taken back to the first floor, to be used again. This, in brief, is the principle upon which the tower evaporators work, but there are endless variations in the details, to some of which we must now direct our attention.

"The first stacks were built of wood. In 1881, L. R. Rogers, son of Mason L. Rogers, to whom I have already introduced the reader, built stacks of brick from the basement to the top of the drying chamber in the second story. This was on the old homestead near Williamson. A year or two after this, W. H. Bush, of Marion, built brick-stacks from cellar to cupola, and such stacks are now frequently seen. The advantages of the brick-stacks are durability and safety from fire. The greatest danger of fire is inside the stack, and the wooden fittings and trays of these brick towers could burn out without setting fire to the building. It is the common practice to build the stack inside the building, chiefly because it is a prevailing opinion that the wind interferes with the draft if the stack is built against the building and exposed on three sides. This opinion is held in respect to brick stacks, in particular, for it is thought that the air will draw through the brick walls, and that they will also become damp in stormy weather, if exposed. This notion appears to be unfounded, however, for W. H. Bush, of whom I have spoken, has recently erected a most successful establishment at his new home at Walworth, with three outside brick stacks with four-inch walls. Mr. Bush has had much experience in the evaporating business, and as I consider his new outfit to be a model in its way, I shall have much to say about it later on. (See Figs. 16, 17, 19, 20, 21, 22, 23.)

"The interior of one of these stacks must now be seen. We will first turn our attention to the basement or foundation of Mr.

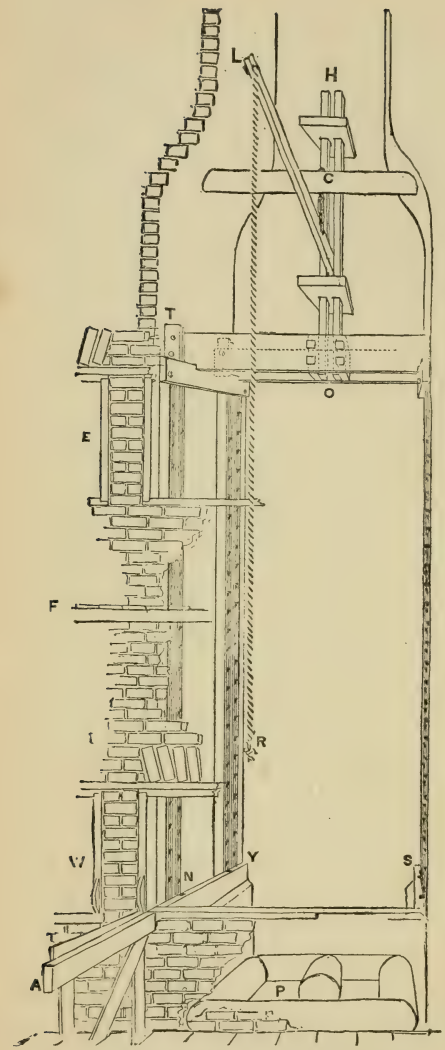

Fig. 16. Evaporater stack with Culver-Cassidy fittings. The diagram looks at the back (O Y S) and inside of the front (T E W Y) of the stack.

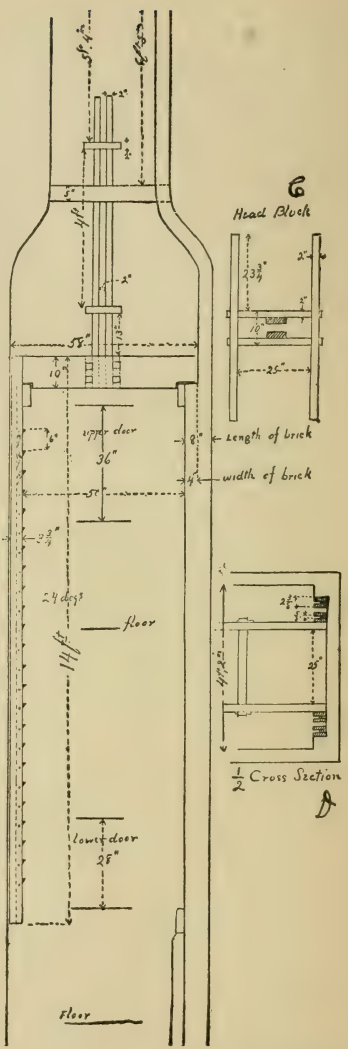

Fig. 17. Shows a front view section. C is the head-block (L H C O) in Fig. 16.) D is cross-section of head-block. See pages 89–92.

Bush's three stacks (Fig. 21). It will be seen that there are three furnaces, one under each tower or stack. There are two long openings into each, to admit the air. The smoke pipes from these furnaces run off across the cellar and discharge into the chimney, which is plainly shown in Fig. 19. Going up stairs, we find the aspect of the stack on the first floor to be that shown in Fig. 22. This is the door through which the trays are placed into the stack. If we raise this door, F W, and look down to the furnace, we see a coil of stovepipe, P in Fig. 16, over which the air passes on its way up the tower. But before we proceed to an examination of the inside of this tower, let us look more carefully to the arrangements in Fig. 22. The tray is laid upon the frames A A (one of these is shown at A in Fig. 16), the little door, F, is raised, and the tray is shoved into the stack. V is a hand-hole, inside of which a thermometer may be hung. W is a large door, fastened by a button at X, to be used whenever the stack is cleaned or repaired. The opening is large enough to admit a man.

"We are now ready to go inside the stack, and we will take Fig. 16 as our guide. The stack is thirty-eight feet high, over all, the walls four inches thick with one coat of plaster on the inside, and the shaft is large enough to admit the regulation size of tray, which is forty-nine inches square. A stack of this size holds twenty-five trays. The back wall of the stack is the blank space bounded by the letters O Y S in the diagram A. A side wall is shown in diagonal section at the left, bounded by the letters T E W Y. The door through which the trays are inserted, on the first floor, is at W, and one of the frames on which the trays are rested when they are shoved in, is at A. (See the same letters in Fig. 22.) The warming pipes are at P (see also Fig. 21). The stack passes into the second story at F, and the upper door, from which the trays are removed, is at E. Above this point, the stack serves as draft-chimney, and as a resting place for the lifting device. Fig. 17 shows a direct front view of a cross-section of the stack.

"The chief essential in the interior arrangement of a tower is some apparatus for lifting the trays, to allow of a tray of fresh fruit to be placed in at the bottom of the stack. Some of these

apparatus work by means of an endless chain run on a shaft and moved by a crank, while others work directly by means of a lever. Various lifting devices, some of them controlled by patents (as mentioned in the descriptions of them), are in use in western New York. Some of the most prominent types are mentioned for the purpose, not of recommending any one of them, but to acquaint the reader with the leading principles in the manual operation of an evaporating establishment.

"The lifting device by means of which the trays are elevated in the Bush stack (Figs. 16, 19, 20) may be called the Culver-Cassidy or Rogers apparatus. The Culver lifting device consisted of a head-block which was raised by a lever, and it connected with two columns or runs of notched strips on either side of the stack. These vertical strips or bars, with the stationary notches, alternately recede into the recesses of the wall, to allow of the lifting of the trays by one bar and the engaging or holding of them in place by the other. The Culver head-block, which is shown at H C O, and the lever at L in Fig. 16, was at the top of the stack. Now, the Cassidy lifter worked from the bottom, raising the trays by means of a chain winding on an iron bar which was turned by a crank outside the stack. But instead of resting the trays on stationary cogs or notches, as the Culver device did, the Cassidy apparatus employed movable dogs. In 1881, L. R. Rogers obtained the consent of the interested parties, as he informs me, and combined the two machines, using the head-block of the Culver and the movable dogs of the Cassidy. This type of lifting device is the most popular apparatus now in use in Wayne county and adjoining regions, largely because it is readily adapted to any size or height of tower, and is simple and direct in operation.

"The lifting apparatus in Fig. 16, therefore, consists of two double runs or columns of dogs on each side of the stack, and a head-block above. The runs of dogs are shown at N and at Y; also at S. One line of dogs in each column is stationary and holds the tray, and the other line is movable and lifts the tray. One of these dogs is seen in Fig. 23. The dog S E is a piece of cast-iron, hung on a pivot D. There are two of these dogs, side

by side. The side of the tray rests on the projecting portion above s. One line of the dogs is raised by the head-block and the tray is lifted with it, the side of the tray as it rises forcing in the dog above it. As the tray passes the dog, the latter falls out by its own weight and the tray rests upon it, whilst the head-block is

Fig. 18. Topping portable evaporator.

let go, and the movable line of dogs falls back to its place. This is not the form of catch or dog which was used in the original Cassidy apparatus, for in that the catches evidently worked by springs and not by gravity. The brief of the original specification called for 'the combination of stationary posts provided with spring-catches, with vertically-movable posts carrying drying-frames and provided with similar spring-catches, and with mechanism for operating the same.' (See *U. S. Gazette of Patents*, ix. 165, 166.)

"The movable or lifting line of dogs is raised by the head-block, shown at H O in Fig. 16. This device is secured to a timber, C, let into the brick-work, and through which the head, H, plays. The apparatus is moved upwards by means of the lever, L, which works on a chain fastened just below C. A rope, R (see also R in Fig. 22), drops from the end of the lever to the operator's hand on the first floor. The operator, therefore, pulls down

Fig. 10. Evaporator of W. H. Bush, Walworth, Wayne Co., N. Y.

on the rope, moving all the trays up one notch, thus leaving the lowest notch free for the insertion of another tray. Looked at from beneath, the head-block presents the outlines shown in diagram C, Fig. 17. The attachment of the block to the lifting-rods is shown in diagram D (showing a cross section), and also at T in Fig. 16.

"While this Culver-Cassidy lifting device is the most common one in western New York, there are still many other styles. The old Alden evaporator, which is now little used, lifted the trays by

means of an endless sprocket chain working on a shaft at the bottom and top of the stack, and bearing fixed dogs at intervals to hold the trays. A crank on the lower shaft served to move the column of trays, and the chain returned on the outside of the stack.

"The Williams evaporator works endless chains wholly inside the stack, and the trays are brought back to the feeding door,

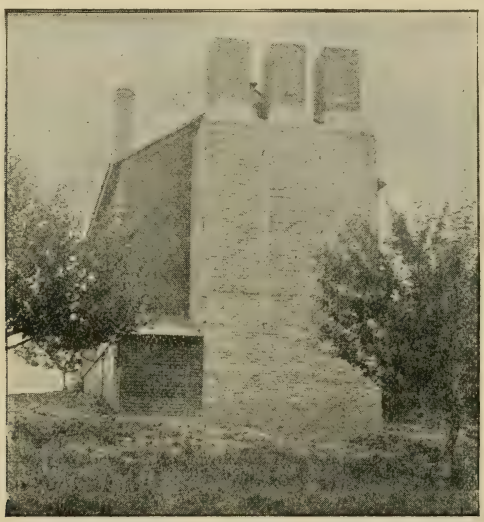

Fig. 20. Same as Fig. 19, rear view. Coal shed on the left.

where they are removed. This saves running up and down stairs with the trays, which is a drawback in the towers already described, and it allows the operator to inspect any tray of fruit at will by turning the crank and bringing it back to the door.
* * *

"A tower dryer constructed upon a different principle is the Automatic, made in Philadelphia. In this machine the trays themselves fit upon one another and form the stack. The entire

pile or stack of trays is lifted by a crank and chain, and a new tray is inserted at the bottom.

"There are other styles of tower driers which have no lifting devices. The trays slide into slots or rest upon cleats, and they may be taken out and replaced higher up, or the evaporating may be controlled wholly by attention to the heat and to ventilating by opening the doors. Most small evaporators designed for preparing fruit for family use are of this description. Any person who is handy with tools should be able, from all the foregoing account, to make a machine which will evaporate from two to ten bushels of berries or apples a day, and thus be able to save most of the fruit about a small plantation which ordinarily goes to waste. A drier containing ten to twelve trays three feet square, should handle ten bushels of apples a day with ease. A small stove may be used for heater, or a brick furnace may be built. Of small, cheap driers in the market, the Topping, made at Marion, N. Y., and shown in Fig. 18, is much used in Wayne county. This can be had in four sizes, with capacities ranging from five to twenty bushels of apples a day.

"4. *Steam Tray-driers.*—Steam is occasionally used in kiln driers, as we have seen, but it is most efficient when applied in closed stacks or boxes underneath trays. For a very large output, steam is probably the most efficient and economical heat, particularly where light power is also wanted for running parers, cider presses, carriers, and the like; and it also has the advantage of being easily carried to all parts of the establishment for warming purposes. Coils of steam pipe are laid in horizontal tiers, the space between each two tiers being just sufficient to allow of the easy insertion of one or two trays. Each tray is, therefore, independent of all others above or below it, and it may be allowed to remain in its original position until the fruit is finished. A narrow horizontal door is provided for each space. These tiers of steam pipes may reach a total height of five to eight feet, and several stands of them are usually placed along side, and the whole is usually boxed in with lumber.

"The use of steam is capable of almost endless modifications to suit individual circumstances, and it is so completely within

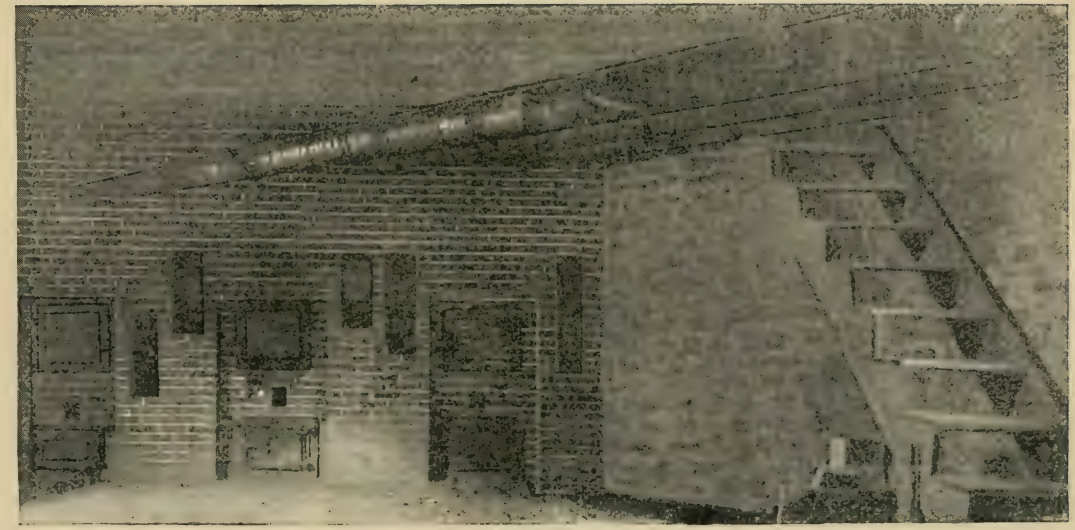

Fig. 21. Basement in evaporating establishment of W. H. Bush.

the control of the operator, that it must increase in popularity as competition and co-operation increases.

"5. *Air-blast Driers.*—The drying of fruit by means of drafts of heated air has received some attention recently in western New York, particularly in the Blanchard establishment at Albion, but

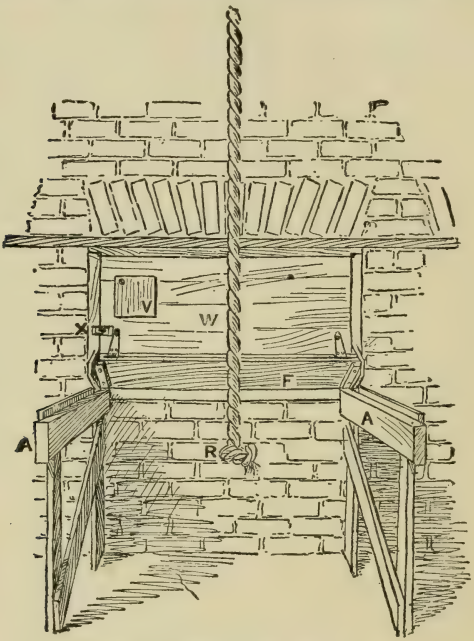

Fig. 22. Feeding door of stack.

as its use is adapted rather more to large establishments than to the individual grower, I shall not discuss it here.

"*Methods and Results.*—As in all other industries, there are all grades of products turned out of the evaporators, the differences being largely attributable to the care and attention which the operator gives to his business. In raspberries, however, with

which this paper is concerned, there are fewer differences in grades than in other evaporated fruits, because the fruits themselves do not need any preparation previous to evaporation, and because even a large number of inferior fruits may be lost in the mass.

"If one contemplates making a large quantity of evaporated products from year to year, he should give particular attention to the plan of his building as well as of the evaporator itself. A basement is handy for coal and storage, and it contains the heating apparatus. The first floor is the receiving room for the fruit, the office, and either this room or a wing contains the paring machines, bleaching boxes, and other accessories. The second floor affords storage for the finished fruit. This is stored in piles on the floor, and the latter should therefore be made of a good quality of dressed and matched lumber. Nothing is more essential to an evaporating establishment than scrupulous cleanliness, for the refuse of the fruit soon sours and decays and makes the place a most forbidding one, while a well kept evaporating establishment has a most attractive, fruity odor. I am sorry to say that there is opportunity for great improvement in matters of simple cleanliness in very many of the evaporating establishments of this state.

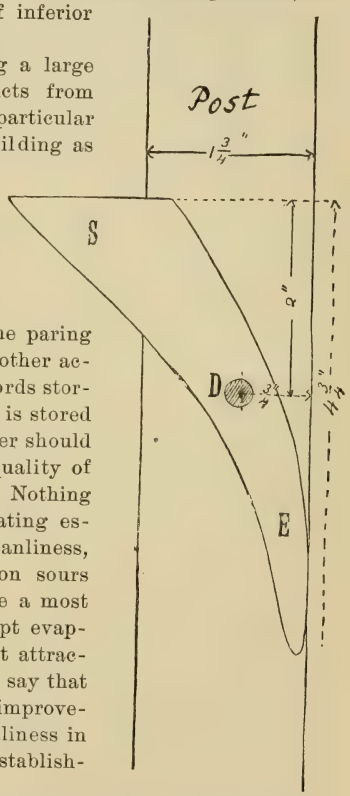

Fig. 23. Dog, or tray rest. See page 90.

"Many of the evaporator buildings are remodeled from old dwelling houses, shops, or other buildings, but they are rarely as handy and efficient as those which are built for the purpose. It should

be borne in mind, when building, that the stacks themselves should occupy a comparatively small part of the establishment; that is, the room needed for storage and working much exceeds that needed for the drying towers. The Bush establishment, shown in Figs. 16, 19, 20, 21, is 24x36 feet, with sixteen-foot posts, three solid brick stacks thirty-eight feet high, and stone basements well finished throughout, and cost $1,400. This establishment has a capacity of about 1,000 bushels of apples a week.

"The tray most commonly used in Wayne county is a frame four feet one inch square, covered with wire screen which has a mesh about one-fifth or one-fourth inch wide. Such a tray receives about sixteen quarts of berries at each filling. A stack of the capacity of Mr. Bush's holds twenty-five trays, so that the stack has from twelve to thirteen bushels of berries, measured when fresh, when it is full. Mr. Hair spreads from twenty-four to thirty quarts of berries upon his five-by-five foot trays. Under ordinary conditions, with heat about 200°F. at the bottom tray, these trays may be moved up—that is, fresh berries inserted—every ten minutes. A twenty-five tray stack, therefore, would be discharged in about four to five hours. The operator will soon find, however, that the time required to finish the fruit varies with many conditions and with the variety of berry. In moist weather and with the first pickings, more time is required because the fruit is plump and juicy. For the later pickings and in dry times, the evaporation may be completed in half the time required for the plump berries. The Ohio raspberry also dries quicker than most other common varieties. It is, therefore, often necessary to 'strip' the trays; that is, to take out five or six or more trays at once, rather than to wait for each one to come out in its appointed turn. A test made by myself in one of the best evaporators of the state, finished Gregg raspberries in four hours. The trays were filled with twenty-four quarts at 11 A. M., with bottom heat 175° and top heat (at upper trays) 100°, the outside temperature being 74°. The fruit came out at 3 P. M., and measured ten quarts to the tray.

* * * * * * * * *

"The staple variety of blackcaps for evaporating is the Ohio,

although the Gregg is crowding it out—and properly so, I think—in many of the best berry sections. There are no close competitors of these two varieties for evaporating purposes. The red varietieties are seldom evaporated, because there is little demand for the product, they consume much time on the tray, and too many berries are required to make a pound. Shaffer is more frequently dried, although it has no conspicuous place in the industry."

DURATION OF PLANTATIONS

The duration of a plantation has already been touched upon in connection with the matter of pruning, and, as there indicated, much will depend on the system of cultivation and care. With ordinary high culture, it is seldom advisable to harvest more than four crops, and one of these, being the first crop, is only a partial one. Of course the plants will continue to bear much longer than this. It is merely a question whether the grower can afford to continue the increased amount of labor needed to keep an old plantation in condition for the smaller yield of poorer fruit which he is likely to get in return.

CLEARING THE GROUND

It is a comparatively simple matter to rid a piece of ground of black raspberry plants, when they are no longer wanted. Mow, rake together, and burn the bushes after fruiting, then plow deep and thoroughly, turning out all the berry stumps, and the work is practically done. Some of them will throw up shoots again when not thoroughly uprooted, but it is very

little trouble to keep them in subjection. This first plowing is heavy and slow work, and many of the stumps will drag out and interfere in a measure with the subsequent harrowing, but aside from that, there is little difficulty. If the land is to be used for small or fine crops, these stumps will need to be removed, but for potatoes or corn they will cause very little trouble. Raspberries seem to leave the land in fine condition for other crops. One of the finest pieces of corn ever obtained, in my own experience, was the first crop taken from the land after plowing under a black raspberry plantation.

HARDINESS OF BLACK-CAPS

The black raspberries are among the hardiest members of the family. The Gregg is one of the most tender varieties, but even this will stand the winters of most localities without serious injury. Of course, in very severe climates, it will be found profitable to put down the plants for winter protection, even though not absolutely necessary to prevent the bush from killing. The increased yield resulting from the greater vitality and vigor of the plants so protected is found to much more than repay the cost of protection. Plants probably "winter-kill" in August as often as in January, and it is as important to take every pains to protect them from insect or fungous injury during summer as to protect them from cold in winter.

YIELDS

In reply to the question, "What do you consider a fair average yield per acre of black-caps?" figures were received from fifty-eight growers. Computing the average from all these replies as accurately as possible, we have for the answer 2,493 quarts, or nearly seventy-eight bushels, per acre. The majority gave the number of quarts or bushels which they considered an average; others placed their answer in the form of "from seventy-five to one hundred bushels," and two gave what they considered high or maximum yields, making it a little more difficult to get the exact average.

The lowest estimate given as an average yield was 576 quarts, the highest 9,600 quarts. Probably neither of these are extensive commercial growers. The latter estimate is very interesting as showing what can be done with the best culture, for it comes from a very intelligent fruit-grower, mainly interested in other lines, and who evidently bases these figures on the yield in his own home garden, as his reply is given in the form of "sixty quarts to the square rod." A majority of the estimates range from two thousand to three thousand two hundred quarts. One grower, whose answer to the question is "seventy-five to one hundred and twenty-five bushels," adds: "We give closer attention to many of the points in berry culture than most growers, and really average better than I give you."

These figures are entitled to a large degree of con-

fidence, for they come from practical men who are in the business and know whereof they speak. To be sure, they are estimates rather than records of yields obtained, but they are estimates based on practical experience, not on theory. By some they will be considered too high, but there are growers who are constantly marketing larger yields.

The yield in pounds of dried product per bushel of green fruit varies greatly with different seasons and parts of the same season. Early in a wet season, when the fruit has made a quick, vigorous and watery growth, it may take four quarts to make a pound of dried fruit. At the end of a very dry season, on the other hand, it may take only two quarts. So far as I have been able to learn, growers expect to average about ten pounds of dried fruit to the bushel. There is considerable difference in varieties in this respect. The Ohio is one of the heaviest yielders, in proportion to the amount of green fruit, owing largely to the greater number of seeds. It is one of the poorest in quality, and possesses less food value per bushel than other varieties. The Gregg follows it closely in yield and is a better berry. In some experiments with seedlings, Goff found that small and juicy berries yielded a higher percentage of evaporated fruit than larger and dryer ones, showing that it does not follow because a berry is rather dry in texture that it will give a good yield when evaporated. In point of quality and food value, the Shaffer ranks among the best, so that from the consumer's standpoint, at least, it is one of the most desirable. It is so near a red

raspberry that when evaporated its quality is fully equal, if not superior, to that of the true reds, while the yield of dried fruit per bushel is not very far below that of the black-caps. It is certainly an excellent berry to dry for the home market, where the price can be made to conform to the cost of production.

The man who is growing berries to evaporate is not likely to suffer so seriously from drought as the one who sells his fruit fresh. Dry weather reduces the number of quarts per acre much more than the number of pounds of dried fruit. A long drought, extending through the early part of the season, does injure the yield, but dry weather at ripening time only, need cause no serious loss if the cultivation has been frequent and thorough. In fact, the man who will cultivate thoroughly enough is practically independent of drought.

USUAL PROFITS

Basing an estimate on the above figures for average yields, we may look for 750 pounds of dried fruit per acre, with thoroughly good management. Judging from past experience, this product, through a series of years, is likely to average from fifteen to twenty cents per pound, making a gross return of $112.50 to $150 per acre from fields in full bearing. The cost of harvesting and marketing may be summed up about as follows: Harvesting at one-half cent per quart, $12.50; evaporating at two and one-half cents per pound, $18.75; cleaning for market at one cent per

pound, $7.50; marketing at one cent per pound, $7.50. This leaves about $75 to $100 for rent of land, cost of growing, and profits. On the whole, raspberry growing for the purpose of making dried fruit can be recommended with confidence to the general farmer who is willing to give it careful attention.

If sold fresh in the market at six cents a quart, the return will be about the same. Accurate figures concerning cost of production are hard to get, and each grower can make his own estimates best. A crop of potatoes can be grown between the rows the year of setting, which will usually repay that year's cultivation, exclusive of the cost of plants, while the second year's crop of fruit will do the same, and perhaps more. Plants can be bought at from $6 to $8 per thousand. If set three by six feet, it requires 2,420 plants to the acre. If set farther apart than this, the number required is proportionately less.

There are always men who are in constant fear of over-production, and who hesitate to undertake enterprises, because they expect everything to be overdone. To this class of men the amount of dried raspberries which are now sold every year would have seemed impossible a few years ago, and yet there seems to be no indication that the limit is reached. The product is easier sold now than then, and perhaps the price does not average materially lower. Moreover, since the business has so greatly increased in extent, the insect and fungous enemies have become more prominent, so that more energy and skill are demanded, and as a consequence the careless and floating class of

growers is becoming discouraged and abandoning it. This is just the condition of affairs which indicates a favorable opportunity for the energetic man to go ahead, and he is the one who nearly always succeeds in his undertakings

CHAPTER IV

THE BLACKBERRIES

As a cultivated plant the blackberry is an American fruit. All the varieties have been developed from native wild plants within the latter half of this century. Like the raspberry, it is, therefore, a new fruit; but raspberries have long been grown in Europe, whereas blackberries have not. It will not be surprising, therefore, if we are not yet able to give complete advice on all points of blackberry cultivation.

SOIL

Considerable diversity of opinion exists among growers regarding the soil best suited to the blackberry, a diversity which is no doubt due, in part at least, to the fact that a blackberry is hard to kill. It is likely to make a partial success wherever it may chance to be, for it possesses a genuine courage which knows no failure, and bravely sets out to make the best of existing conditions.

Many hold that only a comparatively light and poor soil is suitable, in order that the plants may not make too great a growth of wood at the expense of fruit production. On the other hand, growers in the prairie states, where the land is naturally rich, do

not recommend their poorer soils. A strong, well-drained clay loam meets with the most general approval, though light, warm land, having a porous clay subsoil, may give excellent results. On these stronger soils, plants have frequently passed the winter unharmed when parts of the same field on more sterile soil were badly winter-killed.

A soil that is retentive of moisture is imperative, this being the prime essential in blackberry growing. For this reason a cool, northern exposure is generally preferable, because such a location will help to mitigate the severity of drought, the arch enemy of the blackberry. Deep working of the soil before planting, and natural or artificial drainage, are essential both to conserve the necessary moisture and to prevent over supply. None of our cultivated brambles can make satisfactory terms with a wet, heavy soil, and any attempt to compel them to do so will surely result in failure. Land with a high and hard subsoil, therefore, should be tile-drained before planting.

FERTILIZERS

Do blackberries need fertilizers? Some say no; others yes. There must be a reason for this difference of opinion. On strong, moist soil blackberries may produce such a rampant growth that they nearly forget to bear fruit. These overgrown, poorly matured canes are then likely to suffer from the cold of the succeeding winter, and to be left in a condition to repeat the same behavior the following season. It is a signifi-

cant fact, however, that western growers, who may be fairly presumed to have a stronger soil, are strongest in their recommendations of liberal fertilizing. The following statement from O. B. Galusha, as reported in the Transactions of the Illinois Horticultural Society for 1880, is worthy of careful consideration: "A generous feeding of the soil is amply repaid in liberal crops of fruit. In my older plantation, the soil was equally manured throughout, and yet on one side it is naturally considerably richer than the other, and this side produces fully one-third more fruit than the other." This same principle will be found to apply with equal satisfaction to ordinary soils throughout the country, as a whole. If properly managed and pruned, the plants will be able to transform a large amount of plant-food into luscious berries and laughing dollars. Heavy applications of stable manure to young plants, which have not yet sufficient wood to carry full crops, may work injury, especially if on strong, moist soils. On soils of this character, nothing is needed until the plants are in full bearing. If additional plant-food is then desirable, commercial fertilizers, with a liberal proportion of potash, may better fill the need.

PROPAGATION OF THE BLACKBERRY

The propagation of blackberries, as it is most often done by means of suckers, is a very simple operation. In fact, the plants attend to that matter themselves, and all that the cultivator need do is to take care of the product. Indeed, it is owing to the profusion of

suckers thrown up by these plants that many failures occur among those who lack the courage or energy to vigorously destroy them. Unless wanted for planting or for sale, these shoots are weeds in the full sense of the word, and detract as much from the vigor and productiveness of the parent plant as any other class of weeds. The effect on the parent is the same, to be sure, whether the young plants are wanted or not, and no plantation can yield as heavy crops of fruit if called upon to produce plants also. It merely becomes, then, a question as to which are the more profitable and desirable, the plants or the berries. In general, if the plants are needed for planting, or if there is a market for them at fair prices, they are likely to prove more profitable than fruit.

If it is desired to produce many plants of a new and high-priced variety, the number of suckers may be increased by cultivation which tends to disturb the roots. Thrusting a spade into the ground in circles several inches apart about the parent plant will sever many of the roots, practically making root-cuttings of them, thereby causing a large number of plants to spring up. Some careful observers assert that close pruning also tends to increase the number of suckers thrown up, wherefore this might also be used as an aid to rapid propagation.

Plants in large numbers can be cheaply produced from an old plantation which is to be discarded, by cutting away the bushes, plowing and cultivating the ground in spring, and then letting everything grow. If the land is poor, manuring will increase

the vigor of the plants. Roots have also been found to throw up more suckers when in contact with coarse manure.

Although propagation by suckers is by far the most common method, and answers equally well for practical purposes, yet root-cuttings are often used, and give excellent results. This is especially true where a speedy increase of choice varieties is desired. The blackberry is particularly well adapted to this method of propagation, and all the work can be done out of doors. The cuttings may be made either in fall or spring. All roots three-sixteenths of an inch or more in diameter may be used, being cut into pieces two or three inches long. If taken in the fall, these should be stored in boxes of moist sand, which should be kept in a cellar during the winter, or be buried outside on dry ground, where no water will collect about them. It is well to have holes or cracks in the bottom of the boxes, to allow the escape of surplus moisture. The cuttings should be stratified in the boxes in the same way that seeds and nuts are, with a layer of sand or soil, then a layer of cuttings, another of sand, etc.

If the conditions are favorable during the winter, the whitish granular-looking excrescence from the cut surfaces, known as the callus, will have formed before spring, so that the pieces will be in good condition for planting. For this reason cuttings taken in the fall and properly treated during the winter, usually give better success and a more vigorous growth than those taken in spring. In spring the cuttings are planted out in loose, mellow soil, in trenches two to three inches

deep, depending upon the comparative heaviness or lightness of the soil, and about three inches apart in the furrow. They are covered and the soil firmed over them, the same as in planting peas, potatoes, or any other garden vegetable. Mulching the ground with a light layer of straw, sawdust, or similar material, to prevent it from drying out, aids in promoting their growth and insuring a good stand.

For those who have greenhouse facilities, a very satisfactory way is to take up the roots and make the cuttings as early in spring as the ground will permit, stratifying them in boxes of sand as already described, and placing them under the greenhouse benches. Later, as other plants go outside and space permits, these boxes are placed on the benches. By this treatment the cuttings become callused, and are in good condition to go into trenches outside by the last of May.

If a variety is particularly scarce and it is desirable to increase the stock of it with the greatest possible speed, the cuttings may be made smaller, one-half to one inch long, and the whole operation be carried on under glass. In this case the cuttings had better be placed just beneath the surface in beds of sand, and furnished with a gentle bottom heat. The plants are potted off as soon as buds have been developed and are well under way, or when leaf-growth has begun. Sometimes they are sown in shallow boxes of soil after the callus and buds have developed, and allowed to remain till several inches high, then potted, or even set from here directly into the open field, if the weather and soil are in suitable condition.

PLANTING

Before considering how to plant, the question of when to plant should be decided. As already noted in Chapter I., there are arguments in favor of both spring and fall planting. In fact, if planted in late fall or early spring, there is likely to be very little failure in either case, provided the fall-set plants are protected with a covering of soil or coarse manure during the winter. For the great region of the Plains, which is subject to winter as well as summer drought, fall planting is less likely to prove satisfactory than in moister climates. There is much reason to believe that many plants of all kinds perish in these regions from lack of moisture during the winter months. In general, however, it may be safe to assume that fall planting is preferable to late spring planting, and if circumstances are known to be such that the work cannot be done in proper season in the spring, it had better be done in the fall; if the work can be done at the right time, plant in spring.

It goes without saying that the first essential in the operation of planting is to insure a proper and thorough preparation of the soil, a matter which has already been discussed. That done, the question must be settled as to the manner of placing the plants on the field, whether in closely set rows to cultivate only one way, or in check rows to cultivate both ways. This will, of course, be decided by circumstances and the individual preferences of the grower. Like many other questions, it is one on which there

are no records of accurate experiments, comparing the two methods and giving the resulting yield and profits. One of the most enterprising fruit growers in the country, J. H. Hale, of Connecticut, says: "I have seen the largest yield in quarts, the finest fruit and the most satisfactory results, from planting blackberries in hills seven to eight feet apart each way." Nor does he stand alone in recommending this practice, for there are many other progressive and enterprising growers who are adopting the same method. The advantages of the plan are larger and finer fruit, obtained with less expenditure of hand labor. With the cultivator running both ways, little hand-hoeing is required. It is of especial advantage in growing fruit for a critical market, and where wages are high, and help hard to get. The general impression prevails that the yield is less. If so, it is not so well adapted to high-priced land, where the greatest possible return per acre must be had. If, as its advocates assert, however, the yield is as great, or even greater than by hedge-row planting, there seems to be no good reason why the plan should not replace the hedge-row method entirely.

Having decided upon the method to be employed, mark out the land to correspond, plowing good, deep furrows in one direction to receive the plants. In setting, time will be saved if three or four men can work together. Let one carry the plants in a pail of water, and drop them at the intersection of the mark and furrow, while the others set. The roots should be well spread along the furrow, the soil drawn in over them,

and firmed with the hands or feet. Ordinarily this is most conveniently done by working on hands and knees on the opposite side of the furrow from which the soil is thrown out, so that it can be quickly drawn in with the hands. In fine, mellow soil, free from stones, the planter may walk along the furrow, take the plant in one hand, and do the covering and firming with the feet, or at least enough of it to fix the plant in position and protect it from drying out, leaving the balance to be done with hoes. The furrows should be deep enough to admit of setting the plants a little lower than they previously grew, and of doing it easily. Filling in the furrow, beyond what is required to insure satisfactory conditions of growth for the young plants, can be left to follow as a matter of course in the future cultivation.

For row planting, rows eight feet apart, with plants three feet apart in the row, will be found satisfactory; this gives 1,815 plants per acre. Occasionally a grower prefers planting as close as two feet, and others as far apart as four feet

Intermingling varieties to insure more effectual pollination has seldom been considered, though an occasional variety has been known to need the help of neighboring kinds. Recent observations in experimental plots where varieties were growing somewhat isolated has convinced me that it is often an important factor, even among well-known varieties.

Strawberries frequently do well planted among blackberries. They are sometimes set in rows and left till the blackberries smother them out. It is

doubtful whether this practice is advisable, though they may occupy the space between the rows with profit for one or two years.

TILLAGE AND MULCHING

Little need be said on the subject of cultivation in addition to what has already been said on the subject in general (Chapter I.). Some writers have advised no cultivation for the blackberry, at least after the second year, on the ground that cultivation produces a too rampant growth and consequent lack of hardiness. While this may be true in part, the practice of letting them go without cultivating is open to an equally serious if not more grave objection. The most dangerous enemy to blackberry growing in most sections of the country is dry weather, especially if occurring about the time of ripening. Tillage is the most available means at command, in most cases, for overcoming this difficulty. A crop may easily be reduced one-half by drying up on the bushes and, while cultivation cannot entirely prevent this loss, it will do much toward it. Thorough cultivation every ten days throughout the season is the best known substitute for irrigation, and should be vigorously maintained up to the time the fruit ripens, at least.

A cultivator which will cut the suckers below the surface of the ground is a great aid, unless plants are to be grown for sale or for further planting. Two such implements are described in the introductory chapter. A spring-tooth cultivator, drawn by either

one or two horses (Fig. 24), is a most useful tool for blackberry plantations.

Mulching proves very satisfactory where the conditions are favorable. It is especially adapted to the home garden, where patches are likely to be small and inconveniently cultivated. There is sometimes a tendency to induce too late fall growth, and in this respect it is inferior to cultivation, for a cessation of

Fig. 24. Tilling blackberries with spring-tooth cultivator.

tillage practically removes the soil-mulch, at least if rains follow soon to pack the surface.

Mention should again be made of the good results obtained by the system of mulching adopted by M. A. Thayer, of Sparta, Wis. This consists in growing clover, in a field by itself, which is cut when in bloom and applied along the rows, the central space being kept thoroughly cultivated. Of course this is but one of the factors which have contributed to the success attained on the farm mentioned, but the method as a whole has led to some phenomenal yields.

PRUNING

Pruning the blackberry is a very simple operation, if done at the proper time; but if neglected at the time when it should be done the results can never be satisfactory. The only summer pruning required is to pinch the growing cane once, at from eighteen inches to two feet from the ground. There need be

Fig. 25. Low training of blackberries.

no fear of pinching too low, for the cane elongates considerably after being clipped, if still young, and the result is a much better formed bush than if allowed to get three or four feet high before being cut. I wish to reiterate the caution to pinch back the canes when they get to the desired height. It makes a vast difference to the future growth of a bush whether the tip is clipped off when it gets two feet high or whether it is allowed to grow to four feet and then cut back to two feet. Fig. 25 shows a model plantation of Early Harvest blackberries, pinched back to

less than three feet and supported by a wire. At the spring pruning the laterals are cut back to from one to two feet in length. This is an operation demanding much judgment, for it is a fruit-thinning process. Too close pruning will diminish the yield, too little will allow more fruit to set than can be properly matured. Not all varieties are alike in fruiting-habit. The Taylor, one of the best all-round varieties in cultivation, does not bear fruit close to the main stem. Four to eight buds at the base of the branches usually produce no flowers. Unbranched canes often fail to develop flowers within two feet of the ground. Close pruning of this variety, therefore, will take away most of the fruit. Other varieties under observation bore flowers within three or four buds of the main stem. Erie is said to behave like Taylor in this respect and Early Harvest is said to bear its fruit-buds near the main stem at times and near the tips at others. It is, therefore, better to defer spring pruning until the buds develop, unless the grower is sure of his ground.

In the West, where moisture is deficient, growers often prefer to do no summer clipping, merely cutting back the main canes in spring to three or four feet in height. The plan is particularly applicable to varieties which overbear.

As with the other brambles, the old canes are best removed as soon as through fruiting, while they are more easily cut, thereby disposing of whatever fungus spores and insects may be harboring about them.

HARVESTING AND MARKETING

Despite the thorny character of the bushes, blackberries are among the easiest gathered of any of the small-fruits. The fruit when well grown is large, easily picked, fills up fast, and hence is pleasing to the pickers. A word of caution in regard to two things may be needed. The first is never to leave the fruit in the sun after being picked, as a few minutes' exposure to hot sunshine will turn it red and render it more or less bitter and unpalatable. The next point is not to pick it until ripe. The cultivated blackberry has been called upon to bear much undeserved slander and disrepute, simply because it has a habit of turning black before it is ripe. The result is, that oftener than otherwise the berries are picked green, and consumers, supposing them to be ripe because they are black, growl because they are sour or sometimes bitter. For distant markets this cannot be wholly avoided, as the fruit must be picked while still firm, even at the expense of quality. For home use, however, if left till the bees begin to eat them, there will be no cause for complaint at the quality of the cultivated blackberry.

The fruit is marketed either in pint or in quart baskets, as best suits the fancy of the selected market. The blackberry is a fruit which usually meets with a ready sale at good prices, and one which handles well. Many small inland towns and villages consume very considerable quantities of this fruit at prices which are eminently satisfactory to the grower.

USES

Dried blackberries are nearly always quoted in market, yet, so far as I have been able to learn,* none are grown for that purpose, the supply coming almost wholly from the South, where the wild berries are gathered and are dried in the sun. They are usually poor in quality, and quoted at a price which would render it unprofitable to dry them if there were a market for fresh fruit. In order to learn something of their adaptability for this purpose, eight well-filled quart baskets just as we were selling them fresh, were taken for experiment. They were made to correspond in weight, so that each quart, with the basket, weighed one and one-half pounds. Deducting the weight of the baskets left five pounds ten and one-half ounces of fruit in each of two lots of four quarts. Granulated sugar was freely sprinkled over one lot. Four ounces of sugar was thus used, one ounce to each quart, making the weight of this lot plus the sugar five pounds fourteen and one-half ounces. Both lots were put in the greenhouse to dry August 3, on wire screens, and covered with mosquito netting to keep away the flies. After one or two days of sunshine, there came several cloudy ones, and the berries began to mold, so that the netting had to be removed. Those treated with sugar molded less than the others, and stuck to the screens less in drying. August 12 both lots were taken up and weighed. They appeared

*Fred W. Card, Bull. 57, Cornell Exp. Sta.

to be as dry as raspberries usually are when put into the curing room, but quickly began to mold again when put in a pile together. The four quarts dried without sugar weighed at this date one pound ten and one-half ounces. The four quarts dried with sugar weighed one pound fifteen and one-half ounces. From these weights, it appears that not over twelve to fourteen pounds of dried fruit to the bushel can be expected. The weight of sugar applied seems to be retained, and possibly increases the weight slightly in addition, by retaining more of the juices of the fruit. Those treated with sugar seemed to remain in a softer and better condition for cooking. Judging from this attempt, the blackberry dries very slowly, and under present conditions, at least, there seems to be little promise that it can be profitably grown for evaporating purposes. The quality of dried blackberries is low. They seem to be lacking in sugar and pronounced qualities. Yet the addition of sugar in drying and the perfection of methods of evaporating may enable the grower to utilize the surplus crop to advantage. The chief hindrance to such an industry at present is the cheap and inferior southern product.

Although it seems necessary that the fruit should reach the consumer while fresh, its value in household uses is not so fully appreciated as it should be. Ancient writers were inclined to lay great stress on the medicinal qualities of all plants and fruits, and while we are wont to smile at many of the supposed virtues there recorded, we might well profit by studying more closely the uses and virtues of the blackberry.

The value of blackberry wine or brandy in bowel troubles is well known. It is reported that blackberries preserved in one of these forms were found by army surgeons to be the only sure and sovereign remedy against chronic diarrhœa, proving effectual whenever taken in time, even after all other medicines had failed. If the previously prepared wine or brandy is not available, the water from blackberry roots freshly dug and steeped, will usually serve the purpose equally well. This, though an old-time household remedy, has lost none of its effectiveness with the passage of time.

Various recipes are given for the manufacture of wine, one of which I copy from an early edition of "The Gardener's Monthly." "Express the juice through a thick cloth, to prevent any pulp mixing with it. To one quart of juice add two quarts of soft water (cold) and three pounds of sugar. Let it then stand in a wide-mouthed vessel, until fermentation ceases, which will be sometimes after two months. Be careful while fermentation is going on to keep the film skimmed clear from the top of the liquid daily, and to keep the vessel full to the top. A small vessel of the liquid should be kept for filling up the large vessels as the skimmings are removed. When fermentation ceases, strain the wine into bottles. The wine keeps better in large quantities, and to that end put it into large stone jugs, corking and sealing them."

Another recipe adds a quart of boiling water to every gallon of the crushed fruit, before expressing the juice, instead of adding cold water afterwards. It also

adds the white of eggs beaten to a froth and stirred into the juice; spices are also enclosed in a cloth bag, and dropped into it.

Formerly there was a market for good blackberry wine at $2 to $3 per gallon for medicinal uses, and if a glut of fresh fruit occurred, it could be turned into wine to good advantage, but in recent years it seems to have been largely replaced in practice by other medicines and stimulants, and there is little demand for it.

Probably the greatest value of the blackberry, however, is not so much as a medicine to cure disease, as in its healthfulness when used as a food. Perhaps nothing is more conducive to health and good spirits than fresh, well ripened fruit, and among all fruits there is none better adapted to accomplish this much wished-for end than the bright, shining, and luscious blackberry. Not a home in all our land should be without it in abundance.

DURATION OF PLANTATIONS

The profitable duration of a blackberry plantation, as with all other small fruits, depends much on the care and management. They generally last longer than black raspberries, perhaps from five to ten years on the average, longer in special cases. Attempts to lengthen the lifetime of a fruit plantation of any kind are rarely profitable. It is better to force the plants to do their best, get what can be gotten from them before they begin to decline, then let them go, to be

replaced by others. If by one system of management a plant can be induced to produce as much in three years as it ordinarily would in five, take the three-year return every time, no matter if at the end of that time the plant is exhausted and no longer profitable. Others are ready to take its place, on other ground, and to continue the high-pressure production. The greater the yield, within limits, the greater the profit and the more fun there is in the business.

KILLING THE PLANTS

When a plantation has passed its usefulness it may become a difficult task to get rid of it. The capacity of the plants for throwing up shoots from broken roots is then brought into full play, and they make a vigorous fight for life. If the cultivator hesitates or wavers he will surely lose the day. In general, the most practicable method of exterminating them is to mow off and burn the bushes, and plow deep, directly after fruiting. Thorough harrowing with a spring-tooth harrow will then tear out many of the stumps. From that time, all shoots should be kept down by some system of cultivation which will cut them off below the surface of the ground. Replowing some two months later will often be found a help. While some shoots may appear the following year, with this system of treatment they will cause no serious trouble in the cultivation of any ordinary crop. If the land is to be used for fine or delicate crops, the stumps will need to be removed.

HARDINESS

Since the difference between a full crop, with good profits, and no crop, with utter loss, may depend on hardiness alone, it is a matter of no little importance. In the climate of central New York varieties like Brunton's Early, Topsy, and usually Wilson's Early and Wilson Junior, are almost sure to kill to the ground every winter, while Taylor, Agawam, Stone's Hardy, Snyder, etc., are slightly or not at all injured.

In many sections of the West and Northwest, as Colorado, Nebraska, Iowa, Minnesota, etc., none of the varieties prove hardy without winter protection and, curiously enough, the matter of selection for hardiness becomes of less import there than in milder climates. The ability to endure summer heat is there the important consideration. If plants are to remain unprotected during the winter, the selection of varieties should be largely influenced by the question of hardiness. The method of protection is described in the introductory chapter.

YIELD

The blackberries are undoubtedly the best yielders among members of the bramble family. Not only do they yield well when growing wild among the rocks and woods, and even under worse conditions which may sometimes pass under the name of cultivation, but they respond promptly and generously to liberal care and attention. In answer to a request for an estimate of

what each considered an average yield per acre of blackberries, fifty growers in different parts of the country gave replies varying from 1,280 to 10,000 quarts, the average being 3,158 quarts, or over ninety-eight bushels per acre. These figures, obtained as they were from the practical growers themselves, who had no incentive to misrepresent their estimates, are worthy of credence. To be sure, some of the estimates are very high, but others are extremely low, and the average is considerably below the yield which many good growers are securing. It is safe to say, therefore, that any grower whose yields fall much below this average is not living up to his possibilities, and unless some uncontrollable disease or insect is preying upon his plantation, there is something wrong with his system of management, or his location is unfavorable.

A point which those engaged in all lines of agricultural production need to appreciate more and more, is that the bulk of any crop is required to defray the actual cost of production, and that it is only beyond this limit that any profit lies. As an illustration, suppose that by ordinary methods of cultivation an acre of blackberries produces seventy bushels, and that sixty bushels are required to repay the cost of production. Now, if by judiciously increasing the cost of production to seventy bushels by more liberal fertilizing or better cultivation, we can increase the yield to ninety bushels, the profit is doubled. Nor does this fully express the difference, for with an additional expense equivalent to ten bushels, we have secured an additional profit of ten bushels, and the additional outlay has paid a return of

one hundred per cent on the investment, while the first ten bushels only pay sixteen and two-thirds per cent on the investment. In other words, one acre under the second management is much better than two acres under the first, for it is equivalent to growing the second acre with an outlay equal to only ten bushels, instead of an outlay equal to sixty bushels. This reasoning may sound theoretical and visionary, but it is just the kind of operations which are being carried on all the time. It is just this sort of differences, too, which distinguishes the man who is making a success of farming or fruit-growing from the man who only keeps even or runs behind. We should realize that only in the last bushels of the crop the profit lies.

PROFITS

Reliable figures as to the cost and profits of farm crops are very difficult to obtain, for the reason that so few growers keep any records, or know what their crops cost them. Of the few who do keep accurate accounts, not many put the results in print, where they may be accessible to others. Anything said on this subject, therefore, must be very largely in the nature of estimates. For ordinary farm conditions the cost of production per acre may be roughly estimated somewhat as follows:

FIRST YEAR

Rent of land	$5 00
Plants	15 00
Fertilizers	20 00
	$40 00

The other expenses of the first year, including setting and care of the plants, should be offset by the return from the crop which may be planted between the rows to utilize the ground not yet occupied by the berry plants. We may at least expect the plantation to bear four profitable crops of fruit, so that dividing the first year's expense by four, the cost for subsequent years, exclusive of picking and marketing, may be estimated somewhat as follows:

Proportion of first year's expense	$10 00
Rent of land	5 00
Fertilizers	20 00
Cultivation and hoeing	10 00
Pruning	5 00
Removing old canes	5 00
Add to cover deficiencies	10 00
	$65 00

The second year, the crop, which is but a partial one, should about meet expenses. After that, let us place the yield at the average obtained from the replies already referred to, which is 3,158 quarts. If these can be made to net five cents a quart after deducting the cost of picking and marketing, the net return will be $157.90, leaving a net profit of a little more than $90 per acre. If they can be made to net only four cents, the net return will be but $126.32, leaving a profit of but little more than $60 per acre.

In connection with this, for the purpose of seeing what can be done by a thorough-going, energetic man, let us compare the following close estimate made by M. A. Thayer, of Sparta, Wisconsin:

ONE ACRE—FIRST YEAR

Plowing ground	$1 50
Harrowing five times	2 50
Rolling and marking	1 00
2,000 Ancient Briton plants	40 00
Setting plants	7 50
Cultivating ten times	3 75
Hoeing six times	6 00
Laying down for winter	2 50
First year's expense	$64 75

SECOND YEAR

Taking up plants in spring	$1 25
400 new plants to replace dead ones	8 00
Setting 400 plants	2 00
60 posts at six cents	3 60
270 stakes at two cents	5 40
380 rods No. 12 wire	12 60
Setting posts and stakes	5 00
Stringing wire	2 50
Cultivating ten times	3 75
Hoeing four times	4 00
Two loads clover mulching	8 00
Placing clover mulching	3 15
Pinching-back	2 50
Laying down for winter	7 50
Use of tools, etc.	6 00
Total for two years	$140 00

After the second year the annual expense is estimated as follows:

Taking up plants in the spring	$2 50
Cultivating and hoeing	8 00
Mulching	12 00
Nipping-back and trimming	5 00
Laying down for winter	7 50
Tools, etc.	5 00
	$40 00

The estimates for labor are made on the basis of paying $1.25 per day for men and $2.50 per day for a man and team. The system of mulching, as elsewhere explained, consists in growing clover on separate pieces of ground, cutting and spreading it green along the rows, and cultivating the center. The expenses of gathering and marketing, Mr. Thayer places as follows:

Picking per quart	$0 01½
Boxes and cases	01
Packing and selling	01
Total expense per quart	$0 03½

Mr. Thayer admits that these figures show a high cost of production, but feels confident that any reduction means diminished profits, therefore is not to be permitted. This method of treatment gave over 2,000 bushels from ten acres of the Ancient Briton variety in one year. This is, of course, a remarkable yield, but the average on those farms is unquestionably far above that of most growers. Mr. Thayer concludes that under their conditions at that time, a yield of 200 bushels per acre gave a net profit of nearly $250 per acre, while 100 bushels per acre would give about

$80 profit, and fifty bushels per acre little or no profit at all.

Instances are common of admirable yields during a single season. One grower in a small town in central New York sold $500 worth of fruit from half an acre in a recent year. It should be firmly fixed in mind that all such results are exceptional, and no one should use them as a basis for average profits.

I think it may safely be said, however, that with a good market, good management, intelligence and skill, both in growing and marketing the fruit, a profit of $100 per acre can be expected with a fair degree of certainty.

CHAPTER V

THE DEWBERRIES

The dewberry as a cultivated fruit has been such a recent introduction to American horticulture that as yet it can scarcely be said to have a history.

At the summer meeting of the Fruit-Growers' Society of Western New York, held June 24, 1863, James Vick described the dewberries grown by Dr. Miner, of Honeoye Falls, N. Y., and his method of training them. This was the same as the present method of tying the fruiting canes to stakes about five feet high, and allowing the new growth to run at will, most of which will root at the tips. He was growing two varieties, one of which was some ten days earlier than the other. Mention is made of the fact that the berries of the earlier variety were sometimes imperfect, "a common fault with the dewberry." The other variety appeared to bear uniformly perfect berries.* From a later mention of these varieties† it seems that they were sent out by Dr. Miner to some extent, but there is no evidence that they ever received varietal names, and therefore they were probably soon lost to cultivation.

It appears that the Bartel was the first named va-

*Hovey's Mag. of Hort. 1863, p. 319.

†Ibid, 1868, p. 286.

riety introduced. The originator's account of this, together with directions for its management, were given in Purdy's Fruit Recorder for 1875, p. 182. It does not appear to have become very generally known at that time, for in 1879 the editor of "The Gardener's Monthly" writes,* "Of true dewberries, no improved kinds are known under culture." In a previous number of the same volume, however, N. H. Lindsay, of Bridgeport, Conn., is reported as having cultivated two kinds of wild dewberries in a small way for home use, taking plants from the woods. It seems that even he did not know how to propagate them, although a nurseryman and presumably an experienced propagator.

Even as late as 1884 the editor of "The Country Gentleman" says (page 329): "We are not aware that the dewberry (or running brier) is cultivated for sale by any nurseryman. * * * The wild dewberry is often found along neglected fence-rows or in rocky or sterile fields, from which, if desired, it may be transplanted to gardens, and treated like garden raspberries." These statements serve to show how recent is the cultivation of the dewberry in anything like a commercial extent. It was not until the introduction of the Lucretia, which was brought into general notice about 1886, that the dewberry began to occupy any prominent place in American horticulture.

So much for the history of the dewberry. But what of its future? Is there a place for it among our garden

*Gardener's Monthly, Vol. 21, p. 150. See Bailey, Bul. 34, Cornell Exp. Sta., for a sketch of dewberry history.

fruits; and if so, will it prove equal to the occasion and able to fill it properly? Coming, as it does, so early in the season, before the first blackberries are ripe, the first question may be fairly answered in the affirmative. It is to be feared, however, that as we find it, the dewberry is unqualified to fill properly the place which its co-laborers in the garden are ready to accede to it, and unless it can be induced to correct some of its bad habits and overcome its failings, the place is even yet likely to be taken by some young, vigorous and early-ripening blackberry. One serious though excusable fault of the dewberry is its rough exterior and uncultured behavior. It will wound a friend upon the slightest provocation, with no thought of an apology. Yet, bad as its thorns are, this is not its most serious failing. Like many other young people, it is not given to steady, industrious habits. It makes large and glowing promises, but too often fails to fulfil them. It must be said in palliation of its shortcomings, however, that the dewberry has not had fair treatment. The energetic, industrious and aspiring ones have been compelled to associate with the idle and thriftless. While lack of fertilization and consequent production of imperfect fruit can hardly be denied as a family trait, it is no doubt true that the more productive members have suffered unjustly, owing to the behavior of the rogues of the household. There is no disputing the fact that stock of the Lucretia dewberry, as sold about the country, has been badly mixed. As received and grown at the Cornell gardens, it comprises two distinct sorts, one with small blossoms, more delicate growth,

and small, imperfect and worthless fruit; the other with large blossoms, vigorous growth, large, plump and glossy fruit. The cuts (Figs. 26 and 27) well illustrate the difference between these two types, which is in itself a ready explanation of many of the conflicting opinions regarding the Lucretia.

By taking the best of what we already have as a basis for future improvement, there seems to be no reason why the dewberry may not be brought to such a state of perfection as shall render its place assured. In the Wilson's Early and Wilson Junior blackberries we have a type intermediate between the dewberry and the blackberry. This form may suggest lines of breeding which in time shall produce offspring far superior to anything which we now have, either in the blackberry or the dewberry. We need more careful and skillful breeders, who shall breed plants as understandingly as animals are bred, and who shall give us in the results of their toil the fruit treasures which ought ere this to have been ours.

SOIL FOR DEWBERRIES

The dewberry is very largely found on poor or sandy soils the country over. This in itself is a decided indication that comparatively light, sandy soils will prove best adapted to its cultivation, and the general experience of growers throughout the country seems to substantiate the supposition. It is true that instances are reported of success from nearly all kinds of soils, but the best results nearly always

Fig. 26. Lucretia from a good plant. The separate fruit is full size.

Fig. 27. Lucretia from a poor plant. One-half natural size.

come from planting on comparatively light, sandy ground.

LOCATION

The location will probably prove to be fully as important as with any other fruit, when the culture of

dewberries comes to be better understood. In parts of the West, the Windom has been found to give better results in shady locations, the finest berries being found even in dense shade. Because of its habit of growing on dry, sandy ground, location to avoid drought may not be so important as with the blackberry, but any location, like a cool northern exposure, which will tend to mitigate the hot, scorching sun, will undoubtedly prove beneficial.

FERTILIZERS

Thus far the necessity for fertilizers has hardly been made apparent, and it is doubtful whether at the time of planting they are ever advisable. Still, if plants are as productive as they should be, a judicious application of fertilizers, after they have borne two or three crops of fruit, can hardly fail to be of advantage. This will be especially true, of course, if they are growing on light, poor soil. Probably the same materials will be found satisfactory for them as for other members of the genus. The kind used, and the proportion of the different fertilizing elements needed, as in all cases, can best be determined by individual experiment. Suffice it to say that a large amount of nitrogen is not likely to be required.

PROPAGATION

As before stated, the dewberry propagates naturally from tips, like the black raspberry. If it is desirable to propagate them to any extent, attention must be

given to burying these tips in the ground at the proper time, which is when they have about completed their growth. I am not aware that it is ever recommended to cover the whole cane, to induce it to throw out roots along the entire length, but this could undoubtedly be done, and the cane cut into pieces to form plants, if desirable to propagate as speedily as possible. The prostrate habit of the plant would favor such a method, but it is hardly to be recommended in ordinary cases.

Dewberries can also be propagated by root cuttings, the same as blackberries. The method for doing this is explained in the chapter on blackberries. Since it is a general rule, however, that those plants which naturally propagate by suckers also propagate most easily by root-cuttings, a little more care may be demanded, and a larger percentage of failure may be expected than with blackberries.

PLANTING

The same general rules given for the planting of the blackberry will also apply to the dewberry, except that the furrow to receive the plants need not be quite so deep. The question of the distance apart at which they are to be placed will be largely determined by the method of training to be employed. If to be trained to single stakes, four feet apart each way will be found satisfactory; if to wire trellises, six feet by perhaps three feet in the row will be more convenient. If to be trained on low, flat, slat or wire trellises, even

a greater distance between the rows will be needed. One of the objections to this method is that more space is demanded for training the plants than is needed for their maintenance.

The great tendency of the dewberries to fail to set fruit altogether, or to produce small and imperfect fruit, is a point which should always be taken into consideration when planting. There is reason to believe that this is often due to a lack of proper fertilization. Whether this lack of fertilization comes from insufficient pollination, or from lack of potency of the pollen which reaches the stigma, is uncertain. Whatever the cause, the lack is apparent, and the most feasible way of overcoming it is by planting different kinds together in close proximity. It has been conclusively shown that the pollen of many varieties of our larger fruit, notably pears and apples, has not the power to properly fertilize the pistils of the same variety. The same may be true of the dewberries. At any rate, better results seem to have come from planting more than one kind together. Even blackberries planted alongside have seemed to produce a favorable effect in some cases. One instance is reported* where dewberries blossomed full for several years, but produced only a few imperfect berries. Later a block of blackberries was planted beside them, and when these came into bearing, the dewberries began fruiting, and continued to do so regularly. This is an indication, though not proof, that blackberry pollen may fertilize dewberries.

*Trans. Ill. Hort. Soc., 1886: 382.

TILLAGE

Nothing special need be said concerning the tillage of the dewberry. Some growers even advise letting them grow entirely without cultivation or care. This method can hardly recommend itself for any systematic culture for profit, unless it be on some rough, uncultivable and otherwise unutilized piece of ground. As the season advances, the young canes spread out over the ground and tend to interfere with cultivation. It is only necessary to direct them along the row, like strawberry runners, however, and continue the cultivation but one way, if the plants are so set as to admit of cultivation both ways earlier.

PRUNING AND TRAINING

Very little pruning is required. Simply to shorten the canes when they are tied up in spring, if too long, is all that is necessary, unless there is a tendency to produce too many canes, when all but four or five should be removed. With any careful system of cultivation some method of training is essential. Various plans have been recommended from time to time, only part of which it will be necessary to mention here.

One plan consists of a low, flat trellis, of greater or less width, eight or ten inches from the ground, on which the plants are allowed to run. This may be a narrow one of wire, made by driving stakes into the ground, ten or twelve feet apart, and nailing strips of boards a foot or more long, across the top. On these

cross-strips wires are drawn tightly, one at each end and usually two between. Another way of reaching the same end is to fasten pieces of boards to stakes, running the boards lengthwise of the row, one on either side, and nailing slats across between them. Such a low, flat trellis raises the fruit off the ground and keeps it clean, but picking is inconvenient and cultivation is more difficult.

A second plan consists in training to an upright wire trellis, after the manner of grapes. The young canes are allowed to run on the ground, and are tied up to the wires the following spring. This is a very satisfactory method, although it admits of cultivation only one way.

A most simple and satisfactory plan is the one which was recommended by A. J. Caywood as early as 1888.* Let his own words explain it:

"I plant them as I do red raspberries, four feet apart each way, cultivating both ways until the fore part of June, when the renewals get too long to do so. We then direct the renewals of each row along the bottoms of the hills, and cultivate the other way as long as required, and one man has done the directing of our patch in a day. The old canes are taken from the stakes any time after the fruit is off, before tying up in the spring. The renewals are left on the ground all winter, which is sufficient protection here, but if it is necessary to protect them in colder regions, their prostrate position facilitates the work.

"In the spring, one draws the entire hill from under

*Popular Gardening, vol. iv., p. 33.

the other hills in the row, and holds them to a stake, while a boy ties them tightly. This can be done as rapidly as tying red raspberries. I think my patch was the first managed on this plan. We have tried the windrow system, but like staking the plants better."

If the old canes are cut away as soon as through fruiting, the young ones can then be tied to the stake until winter, and cultivation go on unimpeded. This may favor a better development and maturity of the canes than when they are allowed to run on the ground.

HARVESTING AND MARKETING

Whatever applies to the harvesting and marketing of blackberries will apply equally well to dewberries, except that, coming in earlier, they have the market more nearly to themselves. The vines are viciously thorny, and the fruit apt to be so concealed within them as to render the picking difficult and painful. Training the plants to a stake or trellis will in part obviate this difficulty.

The fruit carries well, and can be put into market in good condition. Like many of the blackberries, though perhaps in a more marked degree, it has the habit of turning black before it is ripe. If picked then it is sour and undesirable, so that for home market it should be allowed to get thoroughly ripe before being gathered.

DURATION OF PLANTATIONS

Dewberries persist well in the soil,—in fact, too well, for after they have served their purpose, and it

is desirable to get rid of them, they still persist with a tenacity worthy of a better purpose. They seem often to be unproductive for the first two or three years, afterward coming into more uniform and prolific bearing, and continuing in many cases for a number of years.

KILLING OUT THE PATCH

When it becomes necessary to rid a plot of ground of them, vigorous measures must be adopted. While they do not propagate naturally by suckers, yet when the roots are torn and broken, pieces which are left in the ground have a remarkable ability for bursting forth into plants. The method advised for destroying the blackberry is the best that can be recommended for killing off dewberries; namely, mowing and plowing directly after fruiting, frequent cultivation afterwards, and replowing before winter.

HARDINESS

The inherent hardiness of the dewberry may not be equal to that of many varieties of the blackberry, yet its habit of growth tends to afford it protection which enables it to withstand the cold of winter, in most cases, as well as the blackberries. If not entirely hardy in some localities, the ease with which it can be protected in winter is certainly a point in its favor. The older canes will naturally be cut away before winter, and in any event the protection of them is of no benefit. The young canes, which lie

directly on the ground, and which have been trained along the row in cultivating, are in the most convenient position possible for being covered with soil or mulch. In parts of the country where all kinds must be protected to give profitable results, this is really a point in favor of the dewberry which is well worth considering.

YIELD OF DEWBERRIES

The yield to be expected is one of the moot points in dewberry culture. There is the greatest possible diversity in reports, some growers finding it highly satisfactory in this respect, while others are disgusted with it. Of thirty-eight growers who have grown dewberries, and who replied to the question, "Have you grown dewberries, and, if so, with what success?" twenty-three report good or fair success and fifteen poor success. Much of this diversity of opinion, and much of the failure to secure good results is, without doubt, due to the mixed and inferior character of many of the plants which have been sold. Even where they succeed, however, they have not been grown very extensively, as a rule, and any reliable estimate of an average yield can hardly be formed.

PROBABLE PROFITS

With the question of yield so much in doubt, the question of profit must also be unsettled. It may be said, however, that those who succeed in obtaining a good yield nearly always find them profitable, owing to their season of ripening and consequent high price.

CHAPTER VI

MISCELLANEOUS BRAMBLES

While raspberries, blackberries and dewberries of the types which we have described in the foregoing chapters are the only brambles of much commercial importance in this country, there are nevertheless a few outlying types to which we may profitably give attention.

THE ORIENTAL RASPBERRIES

At least four species of oriental or Japanese raspberries have found their way into the United States, the best known probably being the one reintroduced a few years ago under the name of Japanese Wineberry. Unfortunately they have not proved so valuable as many other Japanese fruits, and have comparatively little to recommend them, so that they are never likely to become very popular nor to be grown to any great extent, though two of them have some value as ornamental plants.

The Mayberry (Japan Golden Mayberry).— This was raised by Luther Burbank, of California, and is said to have been produced from seeds of *Rubus microphyllus*, a Japanese species, crossed with the Cuthbert raspberry. It is claimed to produce a bush six to eight feet high, bearing numerous large white blos-

soms, which are followed by "large, sweet, glossy, golden, semi-transparent berries," which ripen in advance of strawberries. It appears to have developed little value as yet. Thus far we have not succeeded in making it live in Nebraska.

The Strawberry-Raspberry.—This peculiar fruit belongs to a species found wild in Japan, China and the East Indies, and known to botanists as *Rubus rosæfolius.* It has been commonly referred to in horticultural literature under the name *R. sorbifolius*, but this appears to be only a synonym of the older name rosæfolius. The double form of this same species has been long known as a greenhouse plant, cultivated for its flowers, though apparently but little grown. As recently introduced from Japan under the name strawberry-raspberry, it is of interest chiefly as a curiosity, and may be worth growing for that purpose or as an ornamental plant. It is herbaceous in our climate, dying down to the ground each winter and springing up from the roots in spring. It throws up innumerable suckers, making a perfect mat of bright colored foliage. The leaves have a central stalk with five to seven opposite narrow leaflets, and are really very pretty. The mat of plants is so dense that it will keep down nearly all weeds, and the plants continue to bloom and fruit throughout the greater portion of the season. The blossoms are white, pretty and sweet-scented, and the berries bright and showy, a clump of the plants making an attractive bed. It is unproductive, and the fruit in its fresh state is rather unpalatable, varying from sour and insipid to somewhat bitter. When cooked,

however, it is said to develop a pleasant flavor midway between the strawberry and the raspberry, and to give a brilliant, rich garnet color to the syrup. The illustration (Fig. 28), life size, is adaped from "The Rural New-Yorker," 1897, page 257.

The Wineberry (Japanese Wineberry).—This is a raspberry which is found wild in the mountains of central and northern Japan. Its botanical name, now well known, is *Rubus phœnicolasius*. It forms a bush three to seven feet high, with somewhat spreading and rambling canes, which are thickly covered with bright red hairs and weak prickles, standing out at right angles to the stem. The leaves are light green and whitish below. The flowers are very small, white, with large, hairy, viscous sepals, which close over the fruit again after blooming and keep it entirely covered until about ripening time, when they again open. The berry is then white, but turns bright red within two or three days, becoming sweet and agreeable; said to be somewhat intermediate in flavor between the red and the black raspberry. Seeds were sent from Japan to J. T. Lovett, in the summer of 1887, by Prof. C. C. Georgeson, now of Kansas. In 1889 the stock raised from this seed was sold to John Lewis Childs, who introduced it under the name of Japanese Wineberry.* The berry is of good size, firm and handsome, and owing to its peculiar covering is exempt from insect attacks. It has not proved to be of any real commercial value in the United States, being generally tender and unproductive. It is a

*Amer. Gar. 1891, 204.

Fig. 28. The strawberry-raspberry.

peculiar and attractive plant, and well worth growing as an ornamental. It had been known in this country and sold under its true botanical name by Ellwanger & Barry, and perhaps by other nurserymen, long before its dissemination by Mr. Childs. It was described in "The Gardener's Monthly" for January, 1880, and received soon after by the editor, Thomas Meehan, under the name *Rubus Hoffmeisteriana*.

The Chinese Raspberry (*Rubus cratægifolius*).— This raspberry possesses very little value as a fruit-producing plant, but makes a handsome ornamental shrub, and is well worth growing for that purpose. Its flowers are inconspicuous, but its foliage and habit are attractive, and its autumn coloring is often superb. It is more fully described among the ornamental species (page 152) and in the botanical section (Chap. XI.).

ORNAMENTAL SPECIES

We are accustomed to think of the members of this family only as fruit-producing plants, yet many of them possess considerable attractiveness as ornamentals, and are well worthy a place in any grounds. Some of them are beautiful in themselves, especially if grown in free and natural clumps, but more especially are they valuable for grouping with other trees and shrubs. Many of the most desirable species are natives of America, and possibly because of this are better appreciated in Europe than here. It is a well-known fact that we are wont to pass by beautiful things growing

at our doors for something less desirable which comes from a tropical or foreign country.

The ornamental qualities of most of these species have been mentioned in connection with the description of each under the botanical section (Chap. XI.), so that, in most cases, a brief mention of them is all that need be made here.

Rubus odoratus, the Purple-flowering Raspberry, or Thimbleberry, is so common throughout the greater portion of the eastern part of the United States that we scarcely think of it as being ornamental. Yet it is a very pretty and attractive shrub. It is beautiful both in flower and fruit, and doubly desirable because it continues its blossoming and fruiting period over so long a time. The foliage alone is attractive, regardless of the blossoms. This species is frequently mentioned among ornamentals in European journals.

Rubus parviflorus, the Rocky Mountain Thimbleberry, erroneously called Salmon-berry, is closely related. It is better known as *R. Nutkanus*, but since the former name has been found to be the older it must now take the preference. This species and its varieties are found in the region of the great lakes and westward to the Pacific coast. Its fruit seems to have been rather more important in the wild state than that of *R. odoratus*, but, in general the species is much the same, except that the flowers are white. Few attempts seem to have been made to cultivate it. If it could be made to succeed well, it would undoubtedly be a most desirable plant to group with the eastern species.

By far the most desirable and attractive member of this section of the genus is undoubtedly *Rubus deliciosus*, of the Rocky Mountains. This, like the two species already mentioned, has simple leaves, three to five-lobed, serrate, but more rounded than in those species. The flowers are large, pure white and attractive. So far as reported, it has generally proved successful, though it does not flourish under the hot sun and drying winds in Nebraska. It is unquestionably well worthy of more general cultivation than it has yet received. It is somewhat difficult to propagate, which will naturally render it more expensive and harder to get than it otherwise would be. There are nurserymen in the West, however, who make a specialty of collecting these mountain plants, growing them until accustomed to cultivation before offering them for sale, or even propagating them wholly in the nursery. Plants from such sources can readily be obtained, and will generally prove satisfactory.

Rubus cratægifolius is an oriental species of some ornamental value which has been grown somewhat in this country. Its chief merit lies in its foliage. The flowers are small and inconspicuous, and the fruit small, though bright red when ripe. The foliage is dense and bright green, coloring well in autumn, and the bush is pleasing in its habit of growth, so that it possesses considerable value as an ornamental plant, although there is nothing striking about it. It is generally hardy, and will mass well with other plants and shrubs. In Nebraska it has proved disappointing in regard to hardiness, being injured by the winters thus far, even

when protected. The rich autumn color developed by the foliage on the young shoots thrown up from the root in spring has offset the loss of the older canes, however.

Rubus arcticus, though a very pretty little species, can hardly be expected to succeed in cultivation, for it is a native of the far north, and only extends southward upon the high mountain ranges. It is the most delicate and one of the prettiest members of the family, and would be very desirable if it could only be made to succeed.

Rubus phœnicolasius, the "Japanese Wineberry," has been brought more prominently before the public than most other ornamental species (page 148). Its chief attraction lies in the peculiar reddish hairy character of the plant. Except in favorable localities, this is all there is to recommend it, for the canes are killed to the ground every winter, and there are consequently no flowers or fruit. The oddity of the fruit is one of its attractive features, whenever any is produced. It is not at all adapted to planting in clumps and masses, like most of the species previously mentioned.

Rubus spectabilis, the Salmon-berry, is a showy member of the family, found native from California northward along the Pacific coast. It is a vigorous-growing shrub, with leaves made up of three sharp-pointed, sharply toothed leaflets, or occasionally deeply three-lobed only. The flowers are red or purple, large and showy, and the fruit large and good, though probably not abundant enough to render it worthy of cultivation on that account. It seems to succeed well

in England, and there seems to be no reason why it should not do equally well in many parts of our own country. It propagates rapidly from suckers, so that means are sometimes needed to keep it in check. It ought at least to be given a thorough trial, for it is really a very attractive plant.

Rubus laciniatus, the Cut-leaved Blackberry, has been brought to notice from time to time as a desirable ornamental, and heralded as a wonderful fruit-bearing plant. Its names have been numerous, including Parsley-leaved, Oregon Evergreen, Oregon Climbing and Sandwich Island. Sometimes it has been styled a dewberry, and sometimes a blackberry. It is interesting from the peculiar subdivision of its leaves, and an occasional plant will prove useful in certain places, but aside from this feature it possesses no ornamental qualities worthy of special note. In this case the order of things is reversed, for this is a European species, and Americans have given it more attention than is given to it across the water. In some sections there, however, it seems to be prized for its fruit production. As a general rule, at least, it produces little or nothing in this country, though it is reported productive in the North Pacific states. The plant is so desperately thorny that it would be well-nigh hazardous to attempt to pick its fruit, if there were any.

The form commonly offered for sale may be described as follows: Stems nearly round, more or less trailing, fertile ones erect, prickles small at the base, but recurved and strong above, very numerous; leaves

much dissected and sharply serrate; fruit roundish, black, grains large, sweet, with a peculiar musky flavor, borne in loose panicles.

The Double White and Double Pink Brambles are referred to at some length in the botanical section. (Chap. XI.) These are also European species, but they have been long known in this country. The flowers are said to resemble miniature roses more than they do those of the other members of the family. They are reported to be admirably adapted to being grown as single specimens, and it is only when thus planted, giving them a chance for full and symmetrical development, that their beauty is to be fully appreciated. These pretty forms have never become so popular and common as they deserve to be, and apparently they ought to be better known.

There are several other species, not so well known as the above, which may in time prove themselves worthy of being planted for ornamental purposes. One of these is *Rubus trifidus*, or Fire Raspberry, the name applying to the bright red color of the foliage in autumn. This has been tried at the Arnold arboretum and recommended for wider planting.

Another very interesting species, which might perhaps be made to succeed here, is *Rubus Henryi*, from China. It belongs to the simple-leaved section of the genus, and is described as "a tall, climbing shrub, with deeply three-lobed, thick leaves, glabrous above and clothed with a white tomentum below; flowers small, red, in terminal racemes." It may be that this would prove more interesting to botanists, owing to its dis-

tinct character, than it would to plant-lovers in general from any strictly ornamental qualities.

From the above list it will be seen that the genus, though not considered an ornamental one, is far from being destitute of ornamental qualities. In addition to these more strictly so-called ornamental features, the fruit-producing members of the family possess charms to the true lover of fruits which are by no means to be despised. A well grown row of red raspberries, with the scarlet fruit peeping out from among the green foliage, or a row of blackberry bushes covered with clusters of shining black berries, is a sight so attractive that it will be appreciated by many a person on whom the charms of a strictly ornamental plant would fall unheeded, and is not beneath the attention of the most fastidious.

CHAPTER VII

VARIETIES OF RASPBERRIES

Varieties of most of the bush-fruits have long since become so numerous that to attempt to describe them in such a manner as would enable the grower to thereby determine them is utterly impracticable, even if it were possible for any one person to have access to all the varieties. The reader may well ask, therefore, Why attempt to describe them at all? There are several reasons why a complete list of all varieties which are or have been grown in this country, in so far as it can be obtained, with brief descriptive notes concerning them, is needed and likely to be of use. Perhaps the most important of these is the need of some means to prevent duplication of names and consequent confusion, which must inevitably happen when varieties become so numerous as they are now and will continue to be.

Then, too, it is of interest and profit to know something of the history of varieties, how they have originated, and the sources from which they have sprung, in order that we may thereby trace the evolution of our fruit-growing and the progress which has been made. Furthermore, a brief description, with a note concerning its origin and parentage, when these are known, may at times enable the grower to decide

whether a certain variety which may give excellent results in some other region of the country, is likely to do the same under his conditions. While the succeeding lists are as full as it has been possible to make them by a careful search through the literature available, there are doubtless many omissions. Any additions or corrections which others can make will be gladly welcomed by the author.

The varieties in this historical record are arranged alphabetically under five heads:

I. Black raspberries.
II. Purple-cane raspberries.
III. American-type red raspberries.
IV. European-type red raspberries.
V. Unclassified varieties.

I. BLACK RASPBERRIES

Rubus occidentalis

Although the youngest group of raspberries in cultivation, this has come to be the most important one. Immense strides have been made since Nicholas Longworth first transferred the Ohio Everbearing to his dooryard in 1832. The species adapts itself so readily to cultivation, and is so uniformly hardy and productive, ripening its fruit in a comparatively short space of time, and withal is so good to eat, that the wonder is not so much that it has gained in popularity so rapidly, but that it did not come into cultivation sooner. Its adaptability to being grown as a farm crop for evap-

orating purposes has also given a great stimulus to its cultivation in recent years. The future of the black raspberry is assuredly a promising one.

Very little need be said concerning the botanical characters of the black-cap, since the species to which it belongs, *Rubus occidentalis*, is so distinct from the other cultivated species of raspberries. The color of the fruit and method of propagation are alone sufficient to distinguish it from all the others. There is a western wild type, however, very closely related to this one, which has long stood as a species, though apparently more properly ranked as only a variety of *Rubus occidentalis*. This is the form known as *Rubus leucodermis*, found in the mountains of California and adjoining states. It is distinguished from *Rubus occidentalis* chiefly by the color of the fruit, which is yellowish red or wine-colored, by the coarser toothed leaflets and the stouter and more hooked prickles.

The Ohio Everbearing appears to have been the first named variety of black-cap introduced into cultivation. It was found in the state of Ohio, and introduced to public notice by Nicholas Longworth, of Cincinnati, who began its culture in 1832. Next came the American Black, also named Joslyn's Black-cap, Joslyn's Improved, Joslyn's Improved Black-cap, American Improved, etc., which finally came to be known the country over as Doolittle. This was found growing wild by Leander Joslyn, of Phelps, Ontario county, N. Y., and introduced by H. H. Doolittle, of Oaks Corners, about 1850. It is said to have owed its especial prominence and value to the method by

which it was propagated, only the tips from one-year-old plants being used. This variety did much to spread the cultivation of the species throughout the country, and the impetus then gained has steadily increased, until the fruit has become one of the most important. Until its immense increase led to a still more rapid increase and consequent destructiveness on the part of injurious insects and fungi, it was one of the easiest grown and most uniformly successful fruits in cultivation. The development of the evaporating industry has done much to add to its importance, and increase the extent of its cultivation.

Recently the industry has been seriously threatened by the spread of fungous diseases, notably the anthracnose. Further experience, however, seems to promise a feasible plan for keeping it in check, so that the industry need not be crippled.

As this is the youngest member of the raspberry family, there is good reason to hope for much improvement in it. There is a very marked improvement in the best varieties of the present day over the wild plants of the woods, or those first introduced. This improvement seems to be going on rapidly, and there is no reason why it should not continue. We want not only better size and better quality than we now have, but we want equally reliable varieties which will come in both early and late.

Varieties of Black Raspberries

Ada.—A chance seedling which originated with Henry Young, of Ada, Ohio, about 1882 or 1883. Thought by him to be a cross between Doolittle and Mammoth Cluster. Reported as vigorous,

very hardy, productive, and comparatively free from thorns. Fruit large, jet black, and of good quality. Said to bloom later than other varieties, thus being more liable to escape frosts. Season as late as or later than Gregg.

Ak-Sar-Ben.—A seedling accidentally discovered by Ex-Gov. Robert W. Furnas, of Brownville, Nebraska. From the original plant three years old Gov. Furnas picked 113 clusters in 1897, averaging thirteen berries to a cluster. Hardy. Fruit large, of good color and fair quality. Not yet introduced.

Alden.—A name proposed for the Ohio, to better distinguish it from the Ohio Everbearing, but never adopted.—Mich. Exp. Sta., Bull. 111: 256.

American Black (Common Black-cap, Black Raspberry, Thimbleberry, *Rubus occidentalis*).—This is the common black raspberry of the eastern United States. It was described by Downing as follows: "This raspberry, common in almost every field, with large rambling purple shoots, and flattened, small, black berries, is everywhere known. It is frequently cultivated in gardens, where, if kept well pruned, its berry is much larger and finer. Its rich, acid flavor renders it perhaps the finest sort for kitchen use, tarts, puddings, etc. It ripens a little earlier than most of the European sorts."

American Everbearing.—An everbearing black-cap sent out in 1890, by the Cleveland Nursery Company, of Rio Vista, Va. It was named and brought to notice by Mr. Hatfield, of Indiana. Said to be fairly vigorous and hardy, but inferior to some others in productiveness, quality and firmness.

American White (Yellow Cap, Golden Cap, White Thimbleberry).—Similar in all respects to the black-cap, but with yellowish fruit and canes. It is found wild from time to time, and has often appeared in cultivation, though never very popular.

Arctic.—A variety growing at the New York State Experiment Station. Described as vigorous, early, not very large, moderately firm, juicy, and sweet.

August Black.—Produced by Thomas Rivers, England. Downing speaks of the fruit as dark red, which would indicate that it might be a Purple-cane variety, but Mr. Rivers himself, in the Gardener's Chronicle for 1897, p. 516, calls it black. Apparently never cultivated to any extent.

Autumn Black. Another variety produced by Mr. Rivers, and said by him to propagate only from seed, he evidently not understanding the tip-rooting habit of the species.

Babbit.—Originated about 1883 as a chance seedling, near College Springs, Iowa. Sent to the United States Department of

Agriculture, in 1892, by W. R. Laughlin. Said to be very hardy, vigorous, and productive. Fruit medium size, roundish oblate, drupes small and rather numerous; dull black, without bloom, moderately firm, juicy, and good.—Mich. Exp. Sta. Bull. 111: 259.

Babcock Nos. 3, 5 and 9.—Mentioned as on trial at the Geneva (N. Y.) Experiment Station.—Bull. 91: 201.

Barnes.—Mentioned as having nothing peculiar to recommend it.—Ill. Hort. Soc. Rept., 1880: 78.

Beckner.—A chance seedling, which originated in Tippecanoe county, Indiana, about 1855.

Beebe (Beebe's Golden, Beebe's Golden Prolific).—Originated in New York about 1886, with James Beebe, of Cassadaga. Said to be productive, but not different from the common yellow-cap.

Belle.—Sent to The Rural New-Yorker by L. C. Carlow, of Batavia, Ill. Reported to be hardy, vigorous, and productive; very early. As large as Gregg, but lacking in flavor.—Mich. Exp. Sta. Bull. 111: 260.

Belmont.—Originated by John Scobs, of Barnesville, Ohio, and introduced in 1879.

Bluffton.—A seedling raised at Bluffton, Mo.—Mo. Hort. Soc. Rept., 1886: 48.

Bonanza.—Originated on the grounds of W. C. Freeman, North Springfield, Mo., about 1888. Said to be large, with a long season. —Mich. Exp. Sta. Bull. 111: 260.

Bronze Queen.—A variety cultivated and named by Mr. Holman, of Missouri. Said to be a strong grower, hardy, productive. Fruit sweet, of good quality, of a peculiar bronze color.—Mo. Hort. Soc. Rept., 1886: 182.

Burns.—A seedling produced by A. M. Burns of Manhattan, Kans. Fairly productive; medium size, and of good flavor. Claimed to have great ability to withstand drought and heat.

Canada.—Mentioned by William Parry, in 1869, as no longer popular.* A variety sold under this name by Prince & Mills, of Flushing, Long Island, in 1822, and also known as Purple Rose-flowering, indicates that it may have been *Rubus odoratus.*

Carman.—Originated by A. H. Sherwood, Southport, Conn., and named in honor of E. S. Carman, Editor of The Rural New-Yorker. Introduced by G. H. & J. H. Hale. An early variety, ripening about with Tyler, rather more dwarf in habit, but reasonably productive. Fruit of good size, fine quality, and high flavor. A good extra early variety.

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*Gar. Month. 11:237.

Carpenter Seedling.—A seedling originated by Charles Carpenter, of Kelley's Island, Ohio. It closely resembles Beebe's Golden. Vigorous. Fruit small to medium, ripening early.—Sixth Ann. Rept. Geneva (N. Y.) Exp. Sta., p. 336.

Centennial.—Samuel Miller speaks of two varieties under this name: one found by George Husman, near Hermann, Mo., about 1860, and one found by Mr. Grayhill, near Carthage. Both early, productive, of good quality, and firm.—Mo. Hort. Soc. Rept., 1884: 296.

Champion.—An early sort, found growing wild in Clark county, Ohio. Sent out by Frank Murphy, of Donnelsville.—Mich. Exp. Sta. Bull. 111: 263.

Chapman.—A chance seedling found on the grounds of Mr. Chapman, near Cincinnati, and carried to Ross county, Ohio, by F. R. McLean, about 1864. Thought by Matthew Crawford, Prof. W. J. Green and others, to be the same as Ohio.

Chesterfield.—Discovered in successful cultivation in 1884, on a farm in Tidewater, Va. It originated from a wild plant found in Chesterfield county, that state.—The Rural New-Yorker, 1884: 18.

Conrath.—Discovered in 1886 as a chance seedling near a patch of Gregg, near Ann Arbor, Mich., by C. H. Woodruff, who sold the stock to Conrath Bros., for whom it was named. Early, vigorous, productive, large, moderately firm, coal black, ripening early, with a long season. A promising new variety.

Corinth.—Mentioned in Bulletin 22 of the Mass. Hatch Experiment Station, as fairly hardy and productive, late, of medium quality and size.

Cottier Everbearing.—A variety originating with M. T. Thompson, of Rio Vista, Va. Recommended as especially valuable on account of its autumn-fruiting qualities.

Crawford.—Mentioned as moderately productive and hardy at the Mass. Hatch Experiment Station.—Bull. 21: 11.

Cream.—A yellow-cap mentioned by William Parry in 1870. Mich. Exp. Bull. 111: 265.

Cromwell (Butler).—Originated by G. S. Butler, of Cromwell, Conn. Introduced by G. H. & J. H. Hale. Closely resembles Tyler. A berry of fair size and good color, but rather acid.

Cumberland.—A new black-cap recommended from Pennsylvania. Of very large size. Originated by David Miller, Camp Hill, Penn.—The Rural New-Yorker, 1896: 624.

Daily Bearing.—Originated with Mr. Griggs, of Perry county, Ohio, from seed of the Ohio Everbearing, and claimed to be an improvement on that variety. Canes almost without thorns.

Davis.—A yellow-cap, said to be a few days earlier than Golden Queen. Found on the banks of the New River, North Carolina, some years ago, by an old lady named Davis. It was brought to notice by L. P. Hodges, of Sands, that state.—Mich. Exp. Bull. 111: 268.

Davison (Davison's Thornless).—Said to have originated in the garden of Mrs. Mercy Davison, of Gowanda, N. Y. Sent out by Joseph Clinton some time prior to 1866. Probably the earliest variety grown. This, together with the sweetness of its fruit and its freedom from thorns, gave it popularity for the home garden. Not a vigorous grower, and deficient in productiveness.

Doolittle (Joslyn, Joslyn's Improved, Joslyn's Black-cap, American Improved, etc.).—This was the first variety which really gave prominence to the black raspberry as a commercial fruit. It was introduced by H. H. Doolittle, of Oaks Corners, N. Y. Said to have been found wild by Leander Joslyn, of Phelps, Ontario county, N. Y. Mr. Doolittle seems to have taken great interest in selecting and improving this fruit. The starting point may have been from this plant, found by Mr. Joslyn, or it may have been from wild plants in general. What gave the American black-cap especial value under this name was, perhaps, not so much the variety itself, as the improved method of propagation adopted by Mr. Doolittle, in which only the tips from one-year-old plants were used. Whether his stock was derived from one original plant, or from various selected sources, it is certain that the Doolittle raspberry acquired a fixity of type which made it long the standard cultivated black raspberry. It is even yet not far behind many more popular varieties.

Doomore.—A seedling found between two rows of Doolittle, by Gustus Swabley, of Tiffin, Ohio, in 1884. Described by him as tall, erect, with deep blue canes. Fruit without bloom, about the size of the Ohio, ripening somewhat earlier; very productive.—Mich. Exp. Sta. Bull. 111: 270.

Dorchester.—Mentioned in Bulletin 27 of the Guelph, Ontario, Exp. Sta.

Duncan (Kentucky Prolific, Kentucky Mammoth, Kentucky).—Said to have been a chance seedling found on the farm of Jack Smith, in Jefferson county, Kentucky, by a man named Duncan. Apparently a popular variety in Kentucky. Said to be as large as Mammoth Cluster; better in color, firmer, and a better shipper, succeeding on all soils.—Country Gentleman, 1876: 175.

Earhart.—A variety of Illinois origin, introduced by Hale Brothers about 1886. Described as vigorous, hardy, and quite productive. Glossy black, rather small, ripening very early. Produces a small second crop in September.

Early Cluster.—Mentioned in the Report of the Michigan Pomological Society for 1875, p. 197, as a new and promising seedling.

Early Prolific.—Mentioned by Dr. Stayman as "the best early black-cap that we have seen. It is a very strong grower, nearly thornless, very hardy, healthy, enormously productive, and of the best quality. It is as large as Souhegan, and has proved three to four days earlier."—Missouri Hort. Soc. Rept. 1883: 79.

Ebon Beauty.—Found by F. L. Piers in a piece of woodland in Indiana, in 1887. Reported inferior to Gregg in every respect, except hardiness, at the Indiana Experiment Station.—Mich. Exp. Sta. Bull. 111: 272.

Ebony (Farnsworth).—Originated as a chance seedling, about 1885, on the farm of W. W. Farnsworth, of Waterville, Ohio. Said to be vigorous and productive. Medium to large, firm, seedy, of good quality.

Elsie.—A seedling raised by Samuel Miller, of Bluffton, Mo., who described it as very large and excellent. Said to be nearly identical with Surprise.

Emperor.—Mentioned in the Mich. Exp. Sta. Bull. 111, p. 273.

Eureka.—Said to have been discovered wild on the farm of Jacob Smith, in Miami county, Ohio, by J. C. Kester, of New Carlisle. Brought to notice by W. N. Scarff, of the same place. Said to be equal to Gregg in size. Nearly as early as Palmer.

Everlasting.—Described in The Rural New-Yorker for 1882, p. 669, as an autumn-fruiting variety, from Lawrence Co., Pa.

Every Day.—Commonly thought to be identical with the Ohio Everbearing, but considered by Dr. Warder to be a much more continuous bearer, fruiting almost continuously until frost.

Fadely.—Received at the Pennsylvania Experiment Station from Joshua Fadely, of Sassafras, Va. Claimed to be everbearing. A single year's test showed no great tendency in that direction.—Pa. Exp. Sta. Bull. 32: 11.

Fay (Fay's Thornless).—A variety similar to Davison, bearing few thorns. Fruit of good size, firm, black, with little bloom.

Ferndale.—A chance seedling found by W. B. K. Johnson, Allentown, Pa., along the Delaware River. Described as vigorous, with large but not numerous thorns. Productive. Fruit large, black, with heavy bloom. Drupes large; berry rather close, but firm, moderately juicy, of good quality and a good shipper, ripening a little earlier than Gregg.

Florence.—A yellow variety, originating in New Jersey. Introduced about 1881. Said to be hardy and vigorous, with greenish

or yellowish white canes and strong white spines. Of medium size, orange yellow, moderately firm, juicy and sprightly. Thought at the time to have been one of the best yellow varieties.

Gault.—Found by W. C. Gault, of Ruggles, Ashland county, Ohio, growing by the roadside near his place, in 1887, and introduced by him in 1893. Described as medium to large, dull black, with a slight bloom, moderately juicy, and a good shipper. Season very late. Tends to produce a second crop in autumn.

General Negley.—Mentioned by Mr. Arnold, before the Ontario Fruit Growers' Society, as a perpetual bearing black-cap.* Under this name Crozier quotes† from Dr. J. A. Warder as follows: "A seedling, probably from one of the large foreign varieties, Pilot, Hornet or Franconia, originated by General Negley, of Pittsburg. It is vigorous, of foreign aspect and foliage. Stood the past winter well; is productive, rather early. Fruit large, roundish oblong, juicy, high flavor, and very good."

Golden-cap.— A seedling of the American White-cap, originating in Cedar county, Iowa; seems to have received some special notice under this name.

Golden Thornless.—Introduced from Minnesota, by Purdy & Johnston, of Palmyra, N. Y., previous to 1869. Described as moderately vigorous and productive, with few spines. Fruit large, dull orange color, rather darker than American White. Moderately firm, juicy, sweet, pleasant.

Gray.—Mentioned in the Report of the Worcester Horticultural Society for 1881, p. 24.

Green.—Discovered on the grounds of Green's Nursery Company, of Rochester, N. Y., about 1890, and described by them as large, productive and early.—Mich. Exp. Sta. Bull. 111: 278.

Gregg (Great Western, Hoosier Mammoth, Western Triumph).—Found growing wild in a ravine on the Gregg farm, in Ohio county, Indiana, in the latter part of June, 1866. It was most thoroughly tested and widely exhibited before being introduced, and has borne out in a remarkable way the early promises it gave. It was largely introduced by N. Ohmer, of Dayton, Ohio, who first saw the fruit on exhibition in 1875. He bought two hundred plants the following spring, propagated them for three years, then introduced it to the public. Canes large, upright, very vigorous, possessing an abundance of bloom and a peculiar clean, smooth appearance which always makes them noticeable. More difficult to propagate than many other sorts, owing to its upright,

*Gar. Month. 12: 278.

†Mich. Exp. Sta. Bull. 111: 277.

vigorous habit. Fruit large, roundish oblate, with a very decided gray bloom. Flesh very firm, only moderately juicy and sweet. Season late. This is by far the best known and most popular late variety at the present time. It is uniformly healthy and productive, though slightly lacking in hardiness, especially on heavy soils. The plant is slower to attain its full productiveness than most other varieties, but is also slower to decline, so a plantation will remain longer in profitable condition. Though not of the highest quality, it is still a good berry, and its excellent shipping qualities render it especially adapted to market. It is also an excellent variety for evaporating, especially where fruit is picked by hand. It clings so tightly to the receptacle that it is not easily gathered with the berry harvester.

Hale Early.—Sent out for trial by G. H. & J. H. Hale, of South Glastonbury, Conn., but not proving valuable, was never introduced.

Hamilton.—Mentioned by Downing as from Shelby Co., Tenn.

Hannibal (Extra Late).—Described in the Report of the United States Department of Agriculture for 1892 as a large, fine berry of excellent quality. Apparently vigorous and productive, being several days later than Gregg. Originated with W. J. Bradt, of North Hannibal, N. Y.

Harrison.—Named in honor of President Harrison by Henry S. Harris, of White Lane, Salem county, N. J., who found it in a neighbor's garden many years ago. Described as medium to large, rather dry, firm, black, with less bloom than Gregg; good, promising for market. A variety which apparently has never been in the nursery trade to any extent.

Haskell Yellow.—Taken from Massachusetts to Illinois by Dr. Haskell, about 1836.—Mich. Exp. Sta. Bull. 111: 281.

Hawkeye.—A berry found in Iowa, which is thought to have come originally from Indiana. Said to be better than Doolittle, as firm as Gregg, and as large, but earlier.—Iowa Hort. Soc. Rept. 1884: 535.

Hayne Seedling.—A new variety brought to notice by H. Hayne, of Delphi, Indiana.

Hilborn.—An accidental seedling found in an old raspberry plantation, and introduced by W. W. Hilborn, of Leamington, Ont., in 1886. Described as a sturdy grower, very hardy, productive. Fruit nearly as large as Gregg, clear, glossy black, rich and juicy. A favorite variety in many parts of Ohio and Ontario.

Hixon (Hixon's Everbearer).—Mentioned in the Report of the Kansas Horticultural Society for 1886, p. 290, and appears to have attained some prominence in that state.

Hoag (Harkness).—According to A. W. Sias, formerly of Minnesota, this originated with Charles R. Hoag, at Kasson, Dodge county, Minnesota. Later it was disseminated by J. W. Harkness. Wyman Elliot, one of the earliest presidents of the Minnesota Horticultural Society, says that at one time it was named Harkness by their society, but the name of the originator was preferred. Said to resemble Gregg, but to have been more hardy in Minnesota.

Hopkins.—Found wild in the woods, within the present limits of Kansas City, Mo., in the year 1872. Later brought to notice by G. W. Hopkins, of Springfield, Mo., and introduced by Frank Holsinger, of Rosedale, Kans. Described as similar to Tyler, and ripening with it. Fruit medium to large, round, black, with little bloom; texture soft, flavor mild. A good shipper. Considered a valuable variety in the region where it originated.

Idaho.—Mentioned by Crozier,* as possibly a variety of *Rubus leucodermis*, though he says nothing regarding its color. Said to have come from the mountains near Lewiston, Idaho. It was sent out for trial by F. R. Palmer, of Mansfield, Ohio, but did not prove valuable.

Ideal.—A seedling found near the Gregg plantation, in 1890, by C. P. Augur, of Connecticut, who described it as nearly as good as the Sougehan, and larger and better in every way than the Gregg.—The Rural New-Yorker, 1893: 430.

Indiana.—A black-cap from Indiana, introduced in 1884. Described as vigorous, hardy, and productive. Fruit of good size and quality, very firm.

Ironclad (Smith's Ironclad).—A note taken without mentioning the reference says that this originated with Mr. Wilson, of Forest, Ohio, about 1885. Said to be very vigorous, productive, and healthy. Earlier than Tyler, of good quality. Under the name "Smith's Ironclad," Crozier records a variety,† brought to notice in Kansas by a man named Smith, some years ago, he having found a single raspberry plant among a bill of trees ordered from an agent. This was probably some old variety, but still seems to be known in Kansas under the names mentioned.

Kagy Everbearing.—Mentioned in the Ohio Experiment Station Report for 1886, p. 190, as apparently of no value.

Kansas.—Originated as a chance seedling on the farm of A. H. Griesa, Lawrence, Kans., in 1884. Although he had growing, at the same time, several hundred other seedlings from selected stock, this proved more valuable than any of the others.

*Mich, Exp. Sta., Bull. 111: 284.

†Mich. Exp. Sta., Bull. 111: 309.

Described as a vigorous grower, very hardy, and exceedingly thorny, rooting at the tips with unusual ease. Fruit similar to Gregg, fully as large, ripening a week earlier, with less bloom; juicy, of excellent flavor, and firm enough to ship well. One of the promising newer varieties.

Kellogg.—A chance seedling, originally found by George J. Kellogg, of Wisconsin, about 1875. Claimed to be hardy, vigorous and productive. Similar to Doolittle.

Kerr White.—Reported as on trial in Michigan, where it proved to be large, of moderate vigor and productiveness, with light yellow, pubescent fruit.

Key Prolific (Johnston's Sweet).—A black-cap found in the Ozark Mountains, Ark. Grown in Iowa since about 1881. Described as vigorous, very hardy, productive ; not nearly as large as Gregg ; jet black, without bloom, medium to late ; of good flavor, very sweet, and excellent for drying. Reintroduced by Robert Johnston, of Shortsville, N. Y., in 1886, as Johnston's Sweet.—Ia. Hort. Soc. 1887: 98.

Kimball.—Reported from Rhode Island in 1885 by Joseph H. Bourne, of Providence, as a promising new variety, earlier than Souhegan. Found by him growing wild on the farm of James Kimball, near Providence. Never introduced.—Mich. Exp. Sta. Bull. 111: 287.

Lindsey.—A variety said to have originated in Michigan. Fruit of medium size, between Doolittle and Gregg, and said to be better and firmer.—Ia. Hort. Soc. Rept. 1882: 478.

Little (Little's Black-Cap). Originated with John Little, of Ontario. Sent to T. T. Lyon, of Michigan, in 1881. Described as hardy, moderately vigorous, with rather slender, reddish brown canes, almost without spines, which are purplish white. Fruit small, roundish, glossy black, firm, seedy, juicy, acid, rich. Much like Davison's Thornless.—Mich. Hort. Soc. Rept. 1882:169.

Lotta (Brackett's No. 101). Originated on the farm of G. C. Brackett, of Lawrence, Kans. A vigorous, hardy and productive variety. Fruit large, round, black, with slight bloom; quality good; as large as Gregg and somewhat earlier. This is one of the really promising varieties of recent introduction. As on trial at the Cornell University Experiment Station, it appeared to lead all others in productiveness.

Lovett.—Found among a lot of wild seedlings on the grounds of Ezra Wood, of Ohio. Introduced by J. T. Lovett Co., of New Jersey. Said to be vigorous, productive, and to ripen early. Fruit firm, of good size, black, with only slight bloom; apparently thornless. Resembles Tyler in general characteristics.

Lum Everbearing (Autumn Black Raspberry, Lum's Fall Bearing).—Raised by H. B. Lum, of Sandusky, Ohio. Much like the Ohio Everbearing, of which it is a seedling.

Lum Yellow Canada.—An everbearing variety, mentioned in Michigan Experiment Station Bulletin 111: 289.

Macomber.—This name, with numbers or letters appended, has been applied to various seedlings sent out on trial by J. T. Macomber and L. M. Macomber, of Vermont, though apparently not retained as a permanent name of any variety.—Mich. Exp. Sta. Bull. 111: 289.

Manwaring No. 1.—Sent out by C. H. Manwaring, of Kansas. Found by the Geneva (N. Y.) Experimental Station to be small to medium, black, firm, mildly subacid, of good quality, hardy.

May King.—A variety similar to and ripening about with Souhegan, although recommended especially for its earliness.

McCracken.—Originated by William McCracken, of Sunnydale, Kans., and distributed under the name Kansas, though not the same as the better-known variety of that name.

McCormick (Mammoth Cluster, Miami Black-cap, Collinsville Miami, etc.).—For many years the leading black-cap in cultivation. It appears to have originated in Indiana, from the Old or Small Miami. A thoroughly hardy and very productive variety; a vigorous grower, bearing fruit of medium size, but of a slightly reddish black color. Quality good; season medium.

Miami (Miami Black, Old Miami, Small Miami).—A common black-cap, originally found growing along the Miami River, in Ohio. A vigorous, productive variety; of less value than the McCormick, more brownish red, not quite as sweet nor quite as late in ripening.—Downing.

Miller Daily (Miller's Daily Bearing).—Apparently a local variety near Dunreith, Ind. A large, everbearing black-cap; vigorous, hardy, productive. Fruit large, juicy, excellent.

Mills (Mills No. 15).—Introduced by Charles Mills, of Fairmount, N. Y. Raised from seed of the Gregg said to have been fertilized by Tyler. A strong, healthy, upright grower, moderately productive. Fruit of medium size and excellent flavor.

Mills No. 1.—Of the same parentage as the preceding. Described as vigorous, fairly hardy. Fruit large, firm, seedy, moderately juicy, good quality.

Minnesota (Minnesotian).—A western yellow-cap, mentioned in various places.

Mohler.—Originated by D. H. Mohler, New Paris, Ohio, from the seed of the Eureka. Canes large, vigorous, very productive.

Fruit very large, firm, good, black, early. The name "Mohler" seems to have been applied to the Eureka at one time, before the introduction of this variety, which occasioned no little confusion. Discussed in Bulletin 63 of the Ohio Exp. Station.

Moody.—A white variety mentioned by Samuel Miller, in the Missouri Horticultural Society Report for 1884, p. 295, as very productive, of good flavor, good size, and worth having.

Moore Seedling.—Mentioned in the Report of the Ohio Horticultural Society for 1870, p. 62.

Munger.—Originated with Timothy Munger in western Ohio, about 1890. Introduced by W. N. Scarff, of New Carlisle, Ohio. Described as a good shipper, black, of good flavor, large size and very productive.

Mystery.—A variety sent out from Kentucky as an everbearing sort. Reported as of little value, bearing no autumn crop in Minnesota.—Bull. 25.

Nemaha.—Found growing wild by Ex-Gov. Furnas, of Brownville, Neb., along the bluffs of the Missouri River in Nemaha county, of that state. Transferred by him to his garden, and later sent out to be tested by prominent small-fruit growers. Introduced by Green's Nursery Company, about 1883. Very similar to the Gregg, but claimed to be hardier. Vigorous and productive. Fruit large, of good quality, and firm. T. T. Lyon says that it has most of the qualities of the Gregg, with improved flavor and hardiness. Popular in southeastern Nebraska.

New Haven.—A chance seedling which came up on the grounds of E. E. Clark, of New Haven, Conn., proving better than any seedlings he had raised. Described by him as large and vigorous. Fruit juicy, five-eighths to three-quarters of an inch in diameter, with small seeds.—Report of the Connecticut Board of Agriculture 1866: 184.

Norfolk.—Mentioned as unsatisfactory in Michigan.—Mich. Exp. Sta. Bull. 122.

Northfield.—Sent out for trial by M. T. Thompson, of Rio Vista, Va., but found to be of little value and never introduced. —Mich. Exp. Sta. Bull. 111: 294.

Ohio (Alden).—The great evaporating raspberry of the present day, being far more largely planted for that purpose than all others together. The full history of this variety is recorded by Bailey in Bulletin 117 Cornell University Exp. Station, p. 362. Somewhere in the sixties, Hiram Van Dusen, of Palmyra, N. Y., bought a lot of Doolittle plants of A. M. Purdy, of that place. When the plantation began to fail, he found one plant apparently as good as new, which, from previous observation, he

knew to be firmer, more productive, and to ripen later. This plant became the progenitor of the vast multitudes which now people the raspberry fields of western New York and other states. The Doolittle plant mentioned, it was found, came from Ohio, and Mr. Van Dusen called it the "Ohio" to distinguish it from the Doolittle. It was introduced by a son and grandson of Mr. Van Dusen. A. M. Purdy was of the opinion that this was precisely identical with what he grew at that time as the Miami, obtained from Ohio, and states that it was so decided by John J. Thomas and Patrick Barry, who saw them growing on his grounds. This, like many market fruits, though hardy and productive, is not of good quality. It is one of the most seedy varieties grown, and it is partially for this reason, no doubt, that it yields more pounds of evaporated fruit per bushel than other sorts.

Ohio Everbearing (Monthly Black-cap).—A full account of the history of this variety is also given by Bailey in Bulletin 117 of the Cornell University Experiment Station. (See also page 159.) The taking up of this variety by Nicholas Longworth appears to have been the beginning of the cultivation of the black raspberry in America. It is of especial interest on this account, although it has never proved a variety of great value. Its chief distinguishing feature seems to have been its autumn bearing habit.

Older.—A chance seedling found in the garden of Mr. Older, of Independence, Ia., in 1872. It was named in hŏnor of Mr. Older, after his death, by Mr. Burser, of Warren, Ill., and introduced by L. K. Ballard, of the same place. Hardy, strong, vigorous, enduring drought well. Fruit large, nearly destitute of bloom, black and firm, of good quality. Popular in the West.

Onondaga (Mills No. 7).—A seedling raised in 1884 by Charles Mills, of Fairmount, N. Y., from seed of the Gregg growing near Tyler. Vigorous, productive, very large, firm, jet black, ripening with Gregg or a little earlier. Professor Beach, of the Geneva (N. Y.) Experiment Station, says that as far as tested there, it appears to be a desirable acquisition on account of its large size, fine appearance, good quality, and productiveness.

Ontario.—Found on the grounds of E. E. Lord, of Fairport, N. Y., in 1886, and introduced by him in 1872. Claimed to be vigorous, perfectly hardy, and very productive, ripening a week earlier than Doolittle. Fruit large, firm, sweet and rich.

Oregon.—Said to be a native variety of especial value in the state for which it is named. Not as dry as other black-caps, and larger than Gregg. Referred to *Rubus leucodermis.*—Mich. Exp. Sta. Bull. 111: 297.

Ozark.—A seedling brought to notice by Mr. Holman, of Mis-

souri. Said to be a strong grower, and somewhat like Gregg, almost as large, ripening after Hopkins.—Mo. Hort. Soc. Rept. 1886: 182.

Palmer (Palmer's No. 1, Acme).—Originated by F. R. Palmer, of Mansfield, Ohio. Introduced in the fall of 1888. Similar to Tyler, and ripening with it. Claimed to be unusually hardy, early, large, of good quality and wonderfully productive. It has been favorably reported upon from many sections, and is now quite largely grown, especially in the West.

Pioneer (Progress).—Originated on the farm of Jacob Muhl, of Hammonton, N. J. Apparently grown by him for some time before being introduced by the J. T. Lovett Co., who offered it under the name "Progress." Much like Souhegan, but claimed to be later, more vigorous and productive.

Poscharsky Nos. 3, 9, 15.—On test at the Geneva (N. Y.) Exp. Station.—Bull. 91: 202.

Pride of the Market.—The name appeared in L. L. May & Co's. catalogue.

Pride of the West.—Said to be fairly productive and vigorous, large, grayish black, of fair quality, ripening with Gregg.

Queen of the West.—A Kansas seedling, ripening a few days earlier than Souhegan, but larger and more productive.—Mich. Exp. Sta. Bull. 111: 302.

Ransom Everbearing.—Sent out by Stark Bros., of Louisiana, Mo., in 1890.—Mich. Exp. Sta. Bull. 111: 303.

Rex.—A seedling of the Gregg raised by John W. Perry, of Covington, Ohio, in 1884 or 1885. Grown largely by his son, with whom it proves valuable, but has not developed sufficient qualities at the Ohio Experiment Station to warrant its introduction.—Mich. Exp. Sta. Bull 111: 305.

Reyes.—"The sweetest black-cap I have ever tasted."—P. C. Reynolds, Mich. Hort. Soc. Rept., 1886: 63.

Rocky Mountain Cluster.—Mentioned in the Missouri Horticultural Society Report for 1897, p. 27.

Rundell.—A yellow-cap closely resembling Beebe's Golden. Found by Charles Rundell, of New Buffalo, Mich.—Mich. Exp. Sta. Bull. 11: 306.

Saunders No. 60.—A seedling of Gregg, produced by Professor William Saunders, of London, Ont. Fruit very large, purplish black, ripening late, but of rather inferior quality. Canes productive, fairly hardy.—Mich. Exp. Sta. Bull. 111: 307.

Savanna.—A variety obtained from the woods in Indian Territory, near Savanna, and so named by T. V. Munson, of Denison,

Texas, who claimed it to be as large as Tyler, a week earlier, very prolific, and the sweetest black-cap known by him. Said to endure extremes of climate well.—Mich. Exp. Sta. Bull. 111: 307.

Seneca.—Raised by Mr. Dell, of Seneca county, N. Y., and brought to notice by Doolittle & Wright, of Waterloo, N. Y., in 1867. A large late variety, very vigorous and productive. Spines reddish, strong, and numerous. Fruit large, but not a deep black, and somewhat reddish, with a light bloom.

Sinton Thornless.—Recorded by Fuller, in 1867, as similar to Doolittle, but a week earlier.—Mich. Exp. Sta. Bull. 111: 309.

Smith Giant.—Apparently a seedling of the Gregg, produced by A. M. Smith, of St. Catharines, Ont., who reported it hardier than Gregg, and fully equal in quality and productiveness.—Mich. Exp. Sta. Bull. 111: 309.

Smith No. 2.—Sent to the Geneva (N. Y.) Experiment Station, by B. F. Smith, of Lawrence, Kans., who found it growing under an apple tree. Reported medium size, firm, juicy, sweet, good.

Smith Prolific.—A chance seedling found in a strawberry patch on the grounds of N. G. Smith, of Manchester, N. Y. Described as unusually vigorous, very productive; fruit very firm, extra large, bright black, borne in large clusters, sweet. It appears not to have maintained its earlier promises.

Souhegan (Skowhegan).—Originated in the valley of the Souhegan River, New Hampshire, about 1870, from the seed of the Doolittle, by J. A. Carlton. Introduced by G. H. & J. H. Hale in 1881. One of the standard early varieties, widely known and generally prized. Canes hardy, vigorous, and productive. Berries medium to large, jet black, without bloom, of good quality.

Spanish Black.—Grown and sold by Henry Geisler, of Watervliet, Mich., who reports it popular in his vicinity. It is reported to be the Gregg re-named.—Mich. Exp. Sta. Bull. 111: 311.

Spray Early.—A chance seedling brought into cultivation at Fort Atkinson, Wis., about 1884. Described as vigorous, with fruit of medium size, good color, firm, of good flavor and quality.

Springfield.—A chance seedling, found about 1880 on the grounds of J. W. Adams, of Springfield, Mass. Described as a thornless variety, very early, prolific, of good quality and perfectly hardy. Somewhat resembles Davison.

Success (Waters' Success).—Sent out for trial in 1893, by James N. Waters, Fernhill, Ont. Very promising on the grounds of The Rural New-Yorker.—Mich. Exp. Sta. Bull. 111: 318.

Summit.—A yellow variety from Summit township, Crawford county, Pa. It was thought to have originated from seed found in soil excavated at a depth of ten feet. The original plant was

found and transplanted by Daniel Supher, but was brought to notice by A. T. Hobbs, of Randolph, Pa. Canes strong, vigorous, pale orange-yellow; spines short, slightly hooked, rather numerous. Fruit of medium size, orange color, with pink at the base of most of the grains. Firm, rather dry, but sweet and rich.

Surprise.—Found wild, and introduced to notice by Charles Husmann, of Bluffton, Mo., about 1865. Said to be large, more conical and darker in color than the common black-cap, with fewer seeds, and a deep bloom.—Downing.

Surrey.—Introduced by the Cleveland Nursery Co. of Rio Vista, Va. Seemed to promise well in Virginia, but not in Michigan.—Mich. Exp. Sta. Bull. 111: 313.

Sweet Home.—A seedling of Lum's Everbearing, from Illinois. Introduced about 1880. Spoken of as superior to McCormick, being very stocky, with a large and firmer fruit, though so similar to that variety as to be thought by some to be the same.

Thomas (Thomas' Seedling).—Originated by Mr. Thomas, of Marion, Ind.

Thompson Sweet.—Mentioned in Bulletins of the Mass. Hatch Experiment Station, as early, unproductive, lacking in hardiness, vigor and firmness; small, of good quality.

Townsend No. 2.—On test at the Geneva (N. Y.) Experiment Station. Said to be medium to large, firm, somewhat seedy, sweet, of good quality, hardy.

Tyler.—An accidental seedling, found growing among McCormick and Seneca plants on the grounds of Nathan Tyler, of Auburn, N. Y. Five hundred plants were sold to Robert Johnston, of Shortsville, N. Y., who introduced it under the name Tyler. An excellent early variety, of good size and quality, jet black, hardy and productive. It resembles Souhegan so closely that the two are practically indistinguishable, although they originated in different parts of the country. It has been thought to withstand spring frosts better than Souhegan. After the Doolittle passed the zenith of its popularity, these two varieties long stood as the representative berries.

Virginia.—A variety controlled by the Cleveland Nursery Co., of Rio Vista, Va. Said to be large, jet black, round, conical, moderately firm, of excellent quality, holding out well at the end of the season.—Mich. Exp. Sta. Bull. 111: 317.

Wade.—Found by John Wade, of Veedersburg, Ind., in the spring of 1884, under a grape trellis where the birds had dropped the seed the summer before. Described by him as an ironclad variety, wonderfully productive. Fruit showy black, firm, of superior quality, ripening about with Souhegan.

Westchester.—A chance seedling, found in 1861 in the garden of Levi J. Mabie, of Tarrytown, Westchester county, N. Y. Advertised quite extensively some years later, but apparently received little attention.—Mich. Exp. Sta. Bull. 111: 318.

Winona.—An Ohio variety, introduced in 1890. Claimed to be perfectly hardy, vigorous, standing drought well. Fruit large, early, glossy black, of excellent quality, and a good shipper.

Wonder.—An everbearing variety, originating with J. H. Robbins, of Arcadia, Ind. Fruit soft, of good quality, but plants lacking in vigor and productiveness.—Mich. Exp. Sta. Bull. 111: 319.

Woodside.—Originated in New York, from seed sown in a garden. Canes light crimson or a dark scarlet. Spines few. Fruit large, black, with little bloom, sweet and juicy. Produces a second crop in autumn.—Fuller.

Wragg.—An Ohio variety on trial in Michigan.

Yellow Pearl.—A yellow-cap variety, vigorous, productive, often producing a fall crop. Fruit dark, with a slight bloom, sprightly.—Downing.

Yosemite.—Mentioned by William Parry* as too unapproachable on account of its wild nature, covered as it is with thorns. It is a rampant grower, and the berries are large and of poor quality.—Cal. Hort. Rept. 1885: 233. This statement would suggest the question of *Rubus leucodermis* parentage.

Recommended Varieties of Black-caps.

Among varieties widely known and most generally planted, Tyler and Souhegan are doubtless the best known early varieties, though now being replaced by others, especially the Palmer. Gregg is still the standard late berry, though the Nemaha is preferred in places, while Ohio is the great berry for evaporating purposes. Other varieties well and favorably known are Lotta, Older and Kansas. Many of the newer sorts are promising, and may supersede the present leaders when better known.

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*Rural Affairs 7: 81.

II. THE PURPLE-CANE RASPBERRIES

Rubus neglectus

In this group I have endeavored to include all those varieties which are intermediate in character between the red and the black raspberry. Not all of these belong to the true Purple-cane type. The Philadelphia and its numerous seedlings are much nearer to *Rubus strigosus* than to *Rubus occidentalis*. They propagate by suckers, though somewhat sparingly, and are, to all intents and purposes, red raspberries of a slightly darker hue, while the true Purple-cane type propagates by tips, being like black raspberries in habit.

No point in the history of the raspberry is more interesting than to note the number of varieties of the *Rubus neglectus* type, or Purple-cane family, as it was formerly called, which have come into public notice. There are some forty varieties which can be definitely placed in this class. Of a large number which have received so little notice in print that it is impossible to classify them, a fair proportion undoubtedly also belong here. Aside from these there have, no doubt, been many local varieties which never came into public notice. I well remember hearing, when a boy, that black raspberries would turn into reds, and that the purple forms occasionally found growing wild were undergoing that change. I remember a bush of this character growing in the exact spot, as it now seems, where a black-cap had been growing, and in spite of all later training and observation, it is hard to get away from the idea that that bush had changed its politics!

If all the introduced varieties of this type and all the forms growing wild are hybrids, a remarkable tendency to hybridization in this genus is certainly shown. The comparative abundance and productiveness of the type leads rather to the opinion that it is a distinct species, but the variation in the habit of propagation of the different varieties, some being almost entirely reproduced by suckers, while others propagate principally from tips, favors the idea of hybrid origin.

Hybrids are commonly thought to be unproductive, but the Shaffer is one of the most productive varieties known. No one can say positively, however, what the origin has been, and for practical purposes it matters little. The type has long been in cultivation, and is certainly valuable. Hybrids are evidently more common, at least in this genus, than has been supposed. I am now of the opinion that this type, like the intermediate type between the blackberry and dewberry, is primarily of hybrid origin.

Varieties of Purple-cane Raspberries

Addison.—An apparent hybrid between the red and black raspberry. Originated on the grounds of L. M. Macomber, of North Ferrisburgh, Vt. Described as vigorous, hardy, and moderately productive. Canes purplish red, resembling the black-caps in habit, and rooting at the tips, though rather like the reds in color. Fruit medium to large, firm, juicy, and very good, with the flavor of the red raspberry.—Mich. Exp. Sta. Bull. 111: 256.

Babcock.—Sent to the Geneva (N. Y.) Experiment Station in 1892, by Daniel W. Babcock. Reported to be productive and vigorous, with canes of a peculiar purplish color, thickly beset with weak prickles. Fruit crumbling.—Mich. Exp. Sta. Bull. 111: 259.

Beckwith.—An unnamed chance seedling, which originated with Professor M. H. Beckwith, Newark, Del. Described by him as a red berry, and not purple like Shaffer; reproducing by tips. Fruit

resembling the black-caps in shape, aromatic, of excellent quality, and productive as far as tested.—Mich. Exp. Sta. Bull. 111: 260.

Cardinal (Griesa).—Originated on the grounds of A. H. Griesa, Lawrence, Kans., in 1888, apparently from the seed of the Shaffer. A vigorous grower, propagating by tips when young, but throwing up some suckers as it grows older. Fruits large, soft, juicy, dark; flavor somewhat musky. Like the Shaffer, it appears to be particularly susceptible to anthracnose. For this reason the originator cuts out the old canes in winter or spring, and depends upon a new growth to produce fruit.

Caroline.—Originated with S. P. Carpenter, New Rochelle, N. Y., and supposed to be a seedling of Brincklé's Orange, crossed by Golden-cap. Canes hardy and prolific, but not very vigorous. Spines numerous. Fruit medium, roundish-oblate, pale salmon, soft, juicy, subacid, and quality fair. Too soft for market, and dull and unattractive in appearance when over-ripe. The variety suckers freely, and may also be propagated by tips, with care.

Catawissa.—This variety was found growing in a Quaker graveyard, in the village of Catawissa, Columbia county, Pa. It was brought to notice by Joshua Pierce, of Washington, D. C. Canes strong, branching, with dark brown bark and few hooked spines. Fruit medium, dark reddish purple, subacid, juicy, and moderately good. Vigorous and productive, but tender at the North. Produced fruit in autumn to some extent. Prof. C. G. Page, of Washington, D. C., mentions* having one seedling from this variety which is a facsimile of the black raspberry, two vigorous, orange colored seedlings of delicious flavor and one real scarlet, similar in flavor to the wild scarlet raspberry of New England.

Citizen.—A hybrid between Gregg and Cuthbert, produced by Professor William Saunders, London, Ont. On trial at the experimental farms of Canada. Promising at first, but less so later. Remarkably productive.—Mich. Exp. Sta. Bull. 111: 264.

Colossal.—Sent by I. F. Street, of West Middleton, Ind., to the United States Department of Agriculture, in 1892. A seedling of Shaffer, which it closely resembles.

Columbian.—Said to be a seedling of the Cuthbert grown near the Gregg, on the grounds of J. T. Thompson, Oneida, N. Y. A variety of the Shaffer type, which it very much resembles. A strong, vigorous grower, and very productive. Fruit large, moderately juicy, fairly firm, nearly sweet, somewhat darker in color than the Shaffer, ripening a little later.

Dictator.—Said to be a cross between Shaffer and Gregg, produced by Luther Burbank, of Santa Rosa, Cal. Canes much like

*Hov. Mag., 1857: 396.

Shaffer, much shorter, propagating by suckers. Fruit larger than Shaffer, bright red.—Mich. Exp. Sta. Bull. 111: 269.

Duncan.— A hybrid between Gregg and Cuthbert, produced by Professor William Saunders, of Ontario. Described as having large, purple fruit, of better quality than the Shaffer, ripening later, and very productive. Canes strong, vigorous, propagating both by suckers and by tips.

Early Prolific.—A seedling raised from the Philadelphia by Oscar Felton, of Camden county, N. J. Crozier states* that it is several generations removed from the Philadelphia. Hardy, productive, free from thorns. Fruit firm, of good size, with a harsh and acid flavor.

Ellisdale.—A variety of the Purple-cane type, found growing wild on the Ellisdale farm, in Iowa, in 1856, by J. E. Johnson. Introduced by H. A. Terry, of Crescent, Iowa. Canes strong, light red, smooth, with a few straight spines near the base and an occasional hooked one on the upper portion; propagating by tips. Fruit large, roundish oval, light purple, with a whitish bloom; rather firm, and of good quality. Elsdale, from Nebraska, mentioned in Hovey's Magazine 1865: 122, is probably this.

Eureka.—A seedling of the third generation from Shaffer, being larger and brighter red; also said to be more compact in habit, and more productive. Originated with Luther Burbank.

Ganargua.—Found growing wild by Stephen Katkamier, of Farmington, Ontario county, N. Y., about 1867. Described as a vigorous grower, hardy, early, and productive, possessing the everbearing habit; spines numerous. Fruit large, delicate, and juicy, reasonably firm, dark red, approaching purplish brown. Propagates from tips.

Garden (Doolittle's Red Flavored Black-Cap). A variety introduced by H. H. Doolittle, of Oaks Corners, N. Y. The Purple-cane raspberry was also known under this name. Whether this is the same, or whether, indeed, it might have been a true black-cap, it is difficult to say.

Gardiner.—Mentioned as a new variety of unknown origin, intermediate between the Purple-cane and the black-cap.

Garnet.—A seedling of the Philadelphia, produced in 1885 by Professor William Saunders, of London, Ont. Described as hardy, vigorous, and productive. Fruit of medium size, purplish red, slightly conical, of good quality, rather soft, ripening late.—Mich. Exp. Sta. Bull. 111: 276.

Gladstone (Carpenter's No. 2, Erie). A chance seedling, orig-

*Mich. Exp. Sta. Bull. 111:271.

inating with Charles Carpenter, of Kelley's Island, Ohio, who sent it out about 1888, first as Carpenter's No. 2, and then as Erie. Later it was introduced by Green's Nursery Co., of Rochester, N. Y., as Gladstone. Described as vigorous and hardy, producing considerable fruit in autumn. Fruit medium size, dark red, of excellent quality.

Hildreth.—"Introduced by Isaac Hildreth, of Big Stream Point, N. Y., as a native sort found near that place. It does not grow readily from the tips, and produces few suckers. Canes rather strong, spines purplish, stiff, numerous. Fruit medium, roundish oblate, dull red or maroon, thick bloom. Half firm, juicy, sweet, subacid, and similar to Purple Cane in flavor."—Downing.

Hybrid Crimson Mammoth.—Found wild at Adams, N. Y., by Dr. E. R. Maxson, who brought it into cultivation and described it in the Horticulturist, but apparently never introduced it.—Mich. Exp. Sta. Bull. 111: 284.

Merkel.—Described as perfectly hardy and productive, not throwing up suckers. Fruit firm, of excellent quality, with somewhat of a currant flavor. Darker than Cuthbert, resembling Gregg in shape and size.—John F. Rupp, in American Garden, 1891: 369.

Montclair.—Originated on the grounds of E. and J. C. Williams, Montclair, N. J., and supposed to be a seedling of the Philadelphia. Canes strong, vigorous, light red, often branching. Spines quite numerous at the base, rather slender, purplish. Propagates moderately by suckers. Fruit medium to large, roundish oblate, dark red or crimson. Flesh quite firm, juicy, sweet, sprightly, and of good quality.—Downing. Very near to *Rubus strigosus;* perhaps it ought to be included there.

Mote Everbearing.—Raised by L. S. Mote, of West Milton, Ohio. An everbearing variety resembling Catawissa.—Downing.

Mrs. Wood.—Originated with Mrs. Reuben Wood, near Cleveland, Ohio. Described as vigorous and productive. Fruit of medium size, roundish, obtuse, purplish, with a red bloom; moderately firm, juicy, sprightly, subacid, ripening late.

Muskingum (Shaffer's Sister, Melott's Favorite).—Originated in the orchard of Mrs. Simeon Ellis, Coshocton county, Ohio, near the Muskingum River. Named and introduced by James Madison, of Chili, Ohio. Similar to Shaffer, but not as tall, vigorous; fruit of about the same color, equally soft. Season medium to late.

New Rochelle.—Supposed to be a seedling of the Catawissa. Raised by S. P. Carpenter, New Rochelle, N. Y., and apparently introduced by E. W. Carpenter, of Rye, N. Y., though the

Country Gentleman for 1881 speaks of it as having originated with W. S. Carpenter. Said to be less vigorous, earlier, and smaller than the Shaffer, propagating only by tips. Fruit roundish, obtuse conical, red or dark maroon, with a slight bloom. Flesh quite firm, juicy and rich.

Norwood (Norwood's Prolific).—A variety originated in Massachusetts. A vigorous grower, propagating by tips. Fruit of good size, similar to Philadelphia.—Gar. Month. 17: 333.

Percy.—A hybrid between Gregg and Cuthbert, produced by Professor William Saunders, of London, Ont. Said to be of large size and best quality, sweeter than Shaffer, but otherwise much like it.—Mich. Exp. Sta. Bull. 111: 298.

Philadelphia.—A chance seedling, found wild near Philadelphia, Pa., about 1835, which proved itself to be hardy, productive, and well suited to light soils in the southern portions of the Middle states. Described as vigorous, tall, branching, almost free from spines. Fruit medium, roundish, dark crimson or purplish red; flesh rather soft, moderately juicy, mild subacid.—Downing. This variety resembles *Rubus strigosus* much more closely than do the Catawissa, Shaffer, and others of the true Purple-cane type; yet it is evidently intermediate between the red and black raspberries, and not a true red raspberry. Although propagating by suckers, these are produced but sparingly, and the fruit is darker in color than the true red raspberries. Dr. Morse, in the Missouri Agricul. Report for 1886, p. 362, says: "A year ago I found a Philadelphia rooted at the tip in my grounds. This year I watched them, and find that there is quite a tendency to root at the tips. If put in too deeply they damp off. I think it is a different variety."

Purple Cane (Purple Prolific, English Purple, Red Prolific, American Red Cane, Garden Raspberry, Huntsville, English Red, Allen and English Brown erroneously).—This is probably the oldest cultivated variety of this type. It was grown about New York at least seventy-five years ago. It is supposed to have been a native variety. Described as having strong, tall, recurved canes, often branching, reddish purple. Spines rather long, stiff, and moderately numerous. Berries small, purple, good, but too soft for market.

Purple Dulcet.—Mentioned in the Illinois Horticultural Society Report, 1875: 268.

Red Cane.—Probably a synonym of Purple Cane.—Hov. Mag. 1858: 420.

Redfield.—Sent out for trial in 1894 by J. Wragg & Sons, of Waukee, Ia. First offered for sale by the Iowa Seed Company, of

Des Moines, in the fall of 1895. Discovered on the farm of D. W. Humphrew, near Redfield, Iowa. Resembles Shaffer in color and size, but said to be of better quality. Propagates by tips.—Mich. Exp. Sta. Bull. 111: 304.

Reliance.—A descendant of Philadelphia, raised by O. L. Felten, of N. J. Described as hardy, vigorous and very productive. Canes strong, branching, with greenish spines. Fruit large, nearly globular or roundish oblate, dark red or crimson, firm, juicy, sweet and sprightly, but not of high flavor. Figured in Gardener's Monthly 1877: 302. Practically a strigosus variety.

Salzer Everbearing Red.—Origin Illinois. Introduced by the John A. Salzer Seed Co., Lacrosse, Wis., as a cross between the Shaffer and the Marlboro.—Mich. Exp. Sta. Bull. 111: 306.

Sarah.—Originated by Professor William Saunders, London, Ont., from the seed of the Shaffer. Described as a moderate grower, suckering freely, and propagating only that way. Fruit large, round, deep garnet, firm, very juicy, pleasantly acid, and exceptionally rich, ripening after Cuthbert.—Mich. Exp. Sta. Bull. 111: 306.

Saunders Hybrid (No. 53 ?).—A hybrid between Philadelphia and Mammoth Cluster, produced by William Saunders, of London, Ont. Said to be productive, large, dark red, propagating from tips only.—Mich. Exp. Sta. Bull. 111: 303.

Shaffer (Shaffer's Colossal).—This is, at the present time, doubtless, the best known variety of this type. It originated in the garden of George Shaffer, near Scotsville, Monroe county, N. Y., about 1871. Introduced by Charles A. Green, of Rochester. It is a vigorous, upright grower, and one of the most productive raspberries known. Fruit large, dark red or purple, moderately firm, sprightly, subacid. Its color is too dark to be attractive, but if picked before fully ripe, while yet red, it looks fairly well in market. An excellent canning variety. It also dries well, being of more attractive color when dried than true red raspberries, and producing more pounds of dried fruit per bushel. In quality it is not far behind the red raspberries, with a richness not possessed by them.

Shaffer Seedling No. 5.—A seedling of Shaffer, mentioned as on trial at the Rhode Island Experiment Station.

Smith Purple.—Originated with B. F. Smith, of Lawrence, Kans. Possesses all the characteristics of the black-cap except in color of fruit, which is of medium size, good quality, and has the black-cap flavor.—Mich. Exp. Sta. Bull. 111: 310.

Stayman No. 1.—A seedling of Shaffer originated with Dr. J. Stayman, of Leavenworth, Kans., in 1884. Said to be large, re-

sembling the Marlboro, but later. Firm, of good quality, and propagating from tips.—Mich. Exp. Sta. Bull. 111: 311.

Superb (Churchman's Superb). Originated by John Churchman, of Burlington, N. J., and supposed by him to be a seedling of Philadelphia. Plant hardy, moderately vigorous, with large, stout canes, which bear abundantly and propagate by suckers, which increase slowly. Fruit large, rich, tart and juicy, dark scarlet and rather crumbly. Thought by some to be a cross between the Philadelphia and some European sort.

Surprise.—Introduced by H. G. Breese, Hoosick, N. Y. Described as a dark red variety, having the flavor of red raspberries and firmness of berry and growth of cane of the black-caps; has a tendency to fruit in autumn. Apparently of little value.

Wetherbee.—Spoken of as a red variety from New York.* Described as hardy, vigorous, with few spines, and a moderate bearer. Fruit small, round, purple, with slight whitish pubescence, moderately firm, of sprightly flavor, ripening late.

RECOMMENDED VARIETIES

Shaffer and Columbian are the two best known and most desirable varieties of the Purple-cane Group.

III. THE AMERICAN RED RASPBERRIES

Rubus strigosus

The native red raspberry of the United States has been much longer in cultivation than the black raspberry or the blackberry, but is much younger than the European berry. In spite of its youthfulness, it has long since outrun its European cousin and gained control of the commercial red raspberry-growing of the country. While it may be slightly behind the European berry in quality of fruit, it is so thoroughly at home, and adapts itself so readily to cultivation, that it has become a far more desirable market berry. One great

*Gardener's Monthly 22: 81.

objection to the red raspberry as a market fruit is its long bearing season, necessitating so many pickings to secure the crop. The American sorts have the advantage in this regard, although even they ripen too unevenly. They are hardier, and usually have somewhat more slender canes.

Two species are included in the true red raspberries of cultivation,—the European red raspberry, *Rubus Idæus*, and the American red, *Rubus strigosus*. Though similar in general appearance and in their botanical characters, there are essential points of difference. For the strictly botanical differences, the reader is referred to the description of the two species. It may be said, however, that, in general, the European plant is rather stouter and less free in its habit of growth, the leaves are a little whiter beneath, thicker, and generally somewhat wrinkled, and the canes are light colored, bearing purple prickles in some varieties. The prickles on the finer parts are firmer, recurved and less numerous.

The horticultural differences are more marked than the botanical differences, the chief one being the habit of the European raspberry to continue bearing more or less throughout the greater portion of the season after ripening begins. This is a feature which, while it may be desirable in a home berry, is a disadvantage in a market berry. Another important point of difference between the two species is in hardiness. Few, if any of the European varieties can be depended upon to endure our winters, except in the most favorable localities, without protection, and even then they are un-

reliable. It is also probable that our hot, dry summers are as important a factor in working their injury as the cold of winter. No better evidence of their lack of adaptability to our climate is needed than the fact that while there have been something like one hundred varieties belonging to this species introduced in the United States, probably not over five or six are grown at all at the present time, and these only in a very small way. The fruit is generally conceded to be of better quality than our American reds, and if the plants had proved satisfactory, this species would naturally have been in the ascendency. The following account of the history of the red raspberries was contributed to The American Garden by the writer.

History and Future of the Red Raspberries

The history of the European raspberry, *Rubus Idœus*, runs far back into the ages. It it mentioned by Cato, who lived before the beginning of the Christian era, and it appears to have been a natural product of Roman territory. Pliny the Elder, supposed to have written about A. D. 45, mentions it as one of the wild brambles which the Greeks called "Idea," having derived its name from Mount Ida, in Asia Minor, at the foot of which lay the renowned city of Troy. In this mountain were said to dwell fabulous beings, who were credited with being the first to work iron and copper, and with having introduced music and rhythm into Greece. Perhaps we may infer that in the exercise of the marvelous powers which they were alleged to possess, they produced this glorious fruit to appease some angry god, or gladden the eye and delight the taste of a gracious princess. Although deriving its name from this locality, where it was particularly abundant, the raspberry is indigenous over the greater part of Europe and northern Asia. It is impossible to tell whether the plants were cultivated at this early

The Description.

THE Frambope is a kinde of bramble, whose leaues and branches are not muche vnlyke the other Bramble, but not so rough and prickley, nor set with so many sharpe prickles, and somtimes without prickles, especially the newe shutes and tender springes that be not aboue the age of a yeere. The fruite or berrie is redde, but otherwise it is lyke to the other. The roote is long creping in the ground, and putteth foorth euery yere new shutes or springes, the which the next yeere doo bring foorth their flowers and fruite,

The Place.

The Frambope is founde in some places of Douchland in darke woods: and in this Countrie they plante it in gardens, and it loueth shadowye places, where as the Sonne shineth not often.

The Tyme.

The Frambope flowreth in May and June, the fruite is ripe in July.

Fig. 29. Description of the raspberry by Dodoens, 1578.

date, and it is not unlikely that the gods, like many mortals of the present day, were obliged to be content with the precarious supply to be found growing at will in grove and glade. Palladeus, however, a Roman writer of the fourth century, mentions the raspberry as one of the cultivated fruits of that time. From a work written by Conrad Heresbach, entitled "Rei Rusticæ," published in 1570, and afterward translated by Barnaby Googe, it appears that raspberries were little attended to during that period. John Parkinson, in his "Paradisus," published in 1629, speaks of red, white and thornless raspberries as suitable for the English climate. Stephen Switzer, in 1724, only mentions three kinds. George W. Johnson, in his "History of English Gardening," published in 1829, gives the number of cultivated varieties as twenty-three. From these detached notes it appears that although cultivated at least as far back as the fourth century, it nevertheless did not come to be considered a fruit of any importance and demand attention until the close of the sixteenth century, or later.

The raspberry never seems to have been held in such high esteem for its medicinal properties as the blackberry. Gerard Dewes, in his translation of "Dodoen's Niewe Herball," or "Historie of Plantes," published in 1578, enumerates the following "vertues:"

"The leaves, tender springes, fruit and roote of this Bramble are not much unlyke, in vertue and working, to the leaves, shutes, fruite and rootes of the other Bramble, as Dioscorides writeth.

"The flowers of Raspis are good to be bruysed with hony, and layde to the inflammations and hoate humours gathered togither in the eyes, and Erysipelas or wilde fire, for it quencheth such hoate burninges.

"They be also good to be dronken with water of them that have weake stomackes."

The illustration (Fig. 29) shows a specimen of the text of this work, giving the description, habitat and time of flowering of the Framboye, Raspis or Hyndberie, as the raspberry was then called in French, English and German, respectively. The figure of the plant (Fig. 30) is reproduced from John Gerarde's "Historie of Plantes," published in 1597.

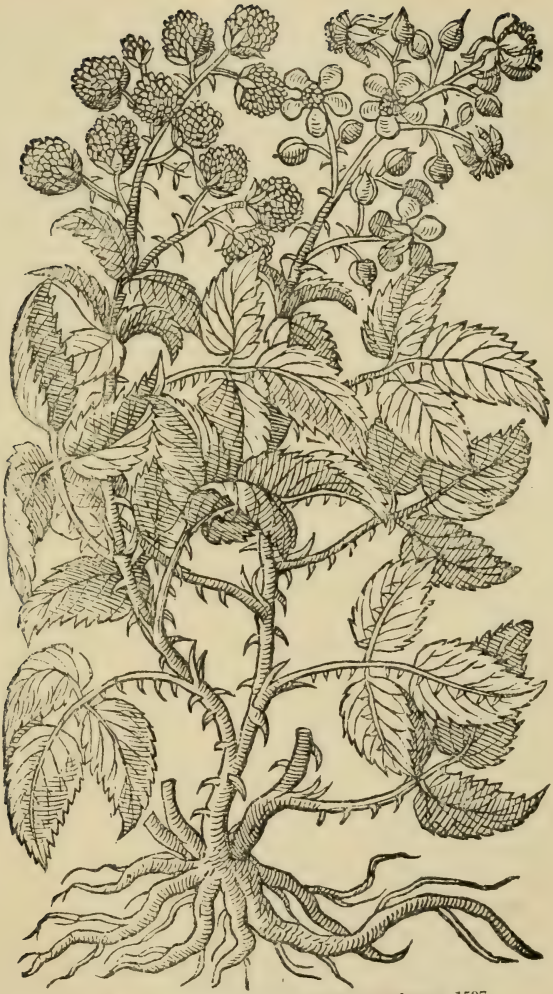

Fig. 30. Gerarde's picture of the raspberry, 1597.

After the settlement of this country the first attempts at cultivation, as with other fruits, were with varieties which had been familiar in England. In the second edition of William R. Prince's "Pomological Manual," published in 1832, fourteen varieties are described and six others mentioned as meriting culture. All but four of these are probably varieties of *R. Idœus*, although in some cases it is impossible to decide with certainty. Of these four, at least three appear to be forms of *R. strigosus* from different localities, while the fourth may belong to the *Rubus neglectus*, or Purple-cane type. One of the varieties which appears to be European may also belong here. The American Pomological Society, at its second session in 1853, recommended four varieties for general cultivation, and commended one more as promising, all of which were foreign sorts. In the catalogue, as recommended by the last session in 1891, there appear fourteen varieties of *Rubus Idœus*, one of which is placed there doubtfully, and six of which are seedlings of American origin. There are also twenty-nine native varieties, six of which are classed under *R. neglectus*, fourteen under *R. occidentalis*, and nine under *R. strigosus*. This, however, is far from representing the true state of comparative cultivation of the foreign and native species and varieties at the present time, for of the fourteen foreign varieties and their seedlings still retained, not over five or six are now cultivated to any extent, and these only in very limited areas.

While the *Rubus Idœus* type is everywhere acknowledged to be much superior in the quality of its fruit, it is not able to maintain itself against summer suns and winter winds, and has had to give place to hardier sorts, better able to fight their own battles and emerge from them bearing abundant trophies of fruit, not so exquisite, perhaps, yet more substantial and sure. Moreover, with the gradual improvement which has gone on, there is at present little need for foreign varieties. The best of our natives yield fruit which is doubtless far superior to that which gratified the gods on Mount Ida in those days of war and wonder. Among the first varieties of *R. strigosus* to become prominent were the Stoever and Brandywine. The former is a form of the American red, found wild near Lake Dunmore, in Vermont, by Jefferson F.

Stoever, and removed to his garden at Tacony, near Philadelphia, where it first fruited in 1859. The Brandywine, or Susqueco, as it was at one time called (Susqueco being the Indian name for Brandywine), is of unknown origin. It first attracted attention in the Wilmington market, and was for a time called Wilmington.

We are accustomed to boast of the marvelous progress in all lines of American development. What advance can we show in the improvement of the raspberry? Some, to be sure, but most of it has been mere accident. In looking up the history of varieties it is the same story over and over again—"a chance seedling found growing wild, etc." Nearly all of our prominent varieties have originated in this way. A few men have gone to work systematically to breed and develop varieties. The first and most prominent of these was Dr. William D. Brincklé, of Philadelphia—a busy physician, who, having a taste for pomology, pursued it as a means of recreation from other duties. He experimented with strawberries and pears, as well as with raspberries. So important was his work in these lines that he seems to be much better remembered for that than for his medical reputation, although he was successful and prominent in this field also. He was president of the American Pomological Society at its second session, and for many years vice-president of the Pennsylvania Horticultural Society, repeatedly refusing its presidency. Unfortunately his work on raspberries was with the *Rubus Idæus* species, and most of the varieties which he produced have suffered the fate of the class to which they belonged; yet he obtained in Brincklé's Orange the variety which has stood as the desideratum to be sought in quality to the present day. Another who achieved good results in this line was David W. Herstine, of Branchtown, near Philadelphia, the originator of the Herstine, Saunders, Ruby and Elizabeth raspberries; yet these were simply seedlings of the Allen, grown in alternate rows with the Philadelphia. William Saunders, of Ontario, has also produced a number of varieties, some of which are said to be hybrids.

Good as the varieties are which we have, we want further improvements. Nothing is good enough to satisfy human demands. We want back all we have lost in giving up the raspberry of our

forefathers beyond the sea; but coupled with that, we want all we have gained from the hardier species of our own country. We want a red raspberry as good as Brinckle's Orange in quality, as large and productive as Cuthbert and of brighter color, as hardy as the Turner, and we want it on a black-cap bush without the thorns. Will we get it? The Shaffer is our nearest approach at present. What the possibilities of careful, systematic and progressive breeding are, only the future can show.

Varieties of American Red Raspberries

American Red (Common Red, English Red).—Prince states in the Pomological Manual published in 1832, that although this is a native of New York, growing naturally in the Catskill mountains, it is frequently termed English Red. He says the shoots are of a dark red hue and grow very long. The spines on the present year's shoots are purplish in color near the base, but greenish, with brown or purplish barbs or points on the upper part. The fruit is one of the earliest to mature, of medium size, fine flavor and greatly esteemed. He comments on the fact that this is the only variety grown to any extent for the New York market, and that there were nearly one hundred acres on Long Island devoted to its culture at that time. Evidently this is a forerunner of American Red raspberry culture, but undoubtedly plants from various sources passed under this name. In fact, from the vague use of the term in early writings, it seems even possible that the name may have been also applied to plants of the *Rubus neglectus* or *Rubus Idæus* types.

Andrews.—Thought by J. T. Lovett to be identical with Highland Hardy, while James Smith, of Iowa, is positive that this and the Highland Hardy are only the Kirtland renamed.

Bagley Perpetual (Bagley's Everbearing).—Originated about 1854, at New Haven, Conn. Introduced in 1858 by A. Bridgeman, a florist of New York. Said to be hardy, and comparatively spineless. Fruit medium, nearly round, dark crimson, rather soft, acid, of poor quality. Bears a second crop in autumn.

Brandywine (Susqueco, Wilmington).—Said to have been found near Brandywine Creek at Wilmington, Del. It first attracted attention in the Wilmington market, and was for a time called the Wilmington. Mr. Edward Tatnell, of that city, undertook to introduce it under the name Susqueco, the Indian name for the Brandywine. Described as stocky, hardy, with large, reddish

colored canes, suckering freely. Fruit medium to large, bright scarlet, firm, juicy, of inferior quality.

Bristol.—According to William Parry, this is a strong, hardy, vigorous grower, suckering immoderately. Fruit resembling the Brandywine, but not so large nor firm.

Canada Red.—Mentioned by Prince in 1832, as a variety first noticed by him growing along the roadside a few miles from Montreal, where the plants were to be met with in great abundance. He describes it as of medium size, resembling the common red in quality, with a high and rather peculiar flavor.

Carpenter No. 1.—A vigorous grower, early, fairly productive. Fruit small to medium, bright red.

Coleman No. 1.—Not a very vigorous grower, but fairly productive. Fruit small, soft, fine-flavored.—Ninth Annual Report Geneva (N. Y.) Exp. Sta.

Cole Prolific.—Exhibited at the Chicago Exposition in 1893 by the Fruit Growers' Association of Ontario. Found growing wild on the farm of R. D. Cole, of Port Dalhousie, Ontario.

Crimson Beauty.—Found by Dr. Stayman, of Leavenworth, Kans., in 1875, growing in a patch of Imperial. Introduced by A. M. Purdy, of Palmyra, N. Y. Described as large, bright, glossy, scarlet, round to oblong, with a pleasant sprightly flavor, early, hardy and productive. Deficient in pollen production, and must be planted near some free pollen-producing sort to bear well. It has never proved valuable in the eastern states.

Cuthbert (Conover, Queen of the Market, Quinby's Favorite).—Probably the best known of all red raspberries, and the most desirable single market sort. It was a chance seedling found by Thomas Cuthbert in his garden at Riverdale, now in New York city, about 1865. It is a strong, vigorous, upright grower, sometimes branching; spines short, stout, purplish, rather numerous toward the base, but often wanting toward the tips. Fruit large, dark crimson, obtuse conical, grains rather small and compact. Flesh quite firm, juicy, sprightly, and of fair quality. Its chief defect as a market berry is its color, which is rather too dark. Mr. Conover, the asparagus man, seeing its value, spread it in his neighborhood, giving it undesignedly the name Conover. In New Jersey it was disseminated by William Parry as Queen of the Market. As yet, no other variety has displaced it.

Eastern King.—Found by O. A. King, of Deering, Maine, in a garden in the town of Westbrook, about 1864 or 1865. A dull red sort, said to be larger, earlier and more productive than the Cuthbert, though this claim has not been substantiated in Michigan.—Mich. Exp. Sta. Bull. 111:270.

Golden Queen.—This was found on the grounds of Ezra Stokes, of Camden, N. J., about 1883, in a twelve-acre patch of Cuthbert. In fact, to all intents and purposes, it is a Cuthbert with yellow fruit. Sports in color from this variety are not uncommon. Instances are recorded where part of the berries on a shoot have been yellow and part red, and even the individual fruits have been variegated. The variety is one of the most satisfactory yellow-fruited sorts, possessing much the same qualities as its parent, the Cuthbert. While light colored varieties are not in demand for market, a few plants for home use are always desirable.

Hansell.—A chance seedling found on the farm of Hansell Bros., near Beverly, N. J., about 1875. Introduced by J. T. Lovett in 1882. Moderately vigorous, suckering freely, with dark, reddish green, hairy shoots. Leaves finely wrinkled. Fruit of medium size, dark red, with slight bloom, rather soft, subacid, pleasant, not rich. Obtained considerable prominence at one time as an early variety. Said to be difficult to transplant and to propagate from root cuttings.

Harris.—Sent out by Z. H. Harris, of Rochester, N. Y., in 1889. Plant fairly vigorous, but of dwarf habit, standing well without pinching. Fruit large, bright, firm, and of good flavor. Not quite hardy.

Highland Hardy (Highland Antwerp).—A sport or chance seedling which originated near Highland village, on the Hudson, about 1870. Very early, but fruit medium to small, red, of poor flavor. Said to be very susceptible to injury from summer heat.

Hudson River Red.—A native red variety. Exhibited before the Cincinnati Horticultural Society in 1860 by F. W. Slack, of Kentucky, who was at that time growing it for the Cincinnati market.—Mich. Exp. Sta. Bull. 111: 284.

Imperial Red (Red Imperial).—A variety grown in New Jersey, where it proved hardy. Fruit medium, roundish, scarlet, half firm, juicy, pleasant. Found to succeed better in the South than most varieties.

I. X. L.—A chance seedling discovered by Charles Schlessler, of Naperville, Ill., in 1887. Said to be vigorous; canes purplish. Fruit light, dull red, of medium size, crumbling, nearly sweet, of good flavor.

Kenyon.—Introduced by O. A. Kenyon, of McGregor, Ia., who found it growing among black raspberries about 1885. Bush of medium size, quite vigorous and fairly productive. Fruit quite large, firm, but crumbling a little, deep dark red, with fair flavor. Clings tightly to the receptacle.

Loudon.—Originated by Frank W. Loudon, of Janesville, Wis.,

who states that it is a seedling of the Turner crossed with the Cuthbert. Canes vigorous, hardy and productive. Berry as large as or larger than Cuthbert, somewhat conical. Grains large, with a suture, firm and of a good red color, but not equal to Cuthbert in quality. One of the promising newer varieties. Introduced by Charles A. Green, of Rochester.

Marlboro.—A popular variety originated by A. J. Caywood, of Marlboro, N. Y., who described it as follows:* "A cross of the Highland Hardy, and a seedling started from English Globe and the Hudson River Antwerp thirty years ago. It is a larger grower, with stronger canes than any known variety; hardy in the fullest sense; berries averaging three-quarters of an inch in diameter, and when not retarded by long, severe drought, many of them will average one inch. It will remain four days on the bushes after ripe, and is then marketable. It is bright crimson in color, and does not lose its brilliancy when over-ripe." Its parentage would indicate a mixture of *Rubus Idæus* blood, but this is not apparent in the plant itself. Charles Downing considered it an improved seedling of the *Rubus strigosus* type. He says:† "The growth and habit of throwing up numerous suckers, the strong, vigorous, upright canes, branching a little toward the top, nearly smooth, with a few short, scattering spines, and peculiar reddish color of the new leaves at the end of the new shoot, the color and flavor of the fruit, all indicate strongly its native origin." This is one of the best known and most generally prized early market sorts. Hardy, vigorous, productive, and a thoroughly good, all-round berry.

Mary.—Raised from seed by Professor William Saunders, of London, Ont. Fruit light red, as large as Cuthbert, with large drupes, moderately firm, quality fair to good. Plant productive, hardy and fairly vigorous.—Mich. Exp. Sta. Bull. 111: 290.

Meredith Queen.—Discovered growing wild in the town of Meredith, Delaware county, N. Y., in 1880, by E. J. Brownell, who sent out plants for trial in 1883. A late variety of moderate growth. Fairly hardy, and only moderately productive, much of the fruit being imperfect. Bearing canes dark brown; new growth purplish green, tips red; suckers freely. Fruit medium size, of pale orange or reddish salmon color. It is a strictly native red raspberry except in color, and is of interest from being a yellow representative of this species.

Michigan (Michigan Early).—Introduced about 1883 by William Parry, of New Jersey. It was generally supposed to have orig-

*Country Gentleman, 1883: 338.

†Mich. Hort. Soc. 1884: 252.

inated in Michigan, though William Parry, Jr., is under the impression that the first plants came from Tennessee. Plant lacking in vigor and productiveness. Fruit roundish conical, rather small, of inferior quality. Moderately firm, dark red. Apparently of no real value.

Miller (Miller's Woodland).—A very popular variety in the Delaware peninsula. Origin same as the Brandywine. Described as strong, vigorous, not too high, adapted to bear very large crops without drooping, hardy and productive. Fruit very large, bright crimson, which it holds well in market; firm, sprightly, subacid, of excellent quality. Resembles Brandywine under favorable circumstances, but ripens earlier. Said to give its largest pickings very early, but its largest berries very late. It has not succeeded so well in other sections.

Miller Favorite.—Mentioned as on trial at the Michigan Experiment Station in 1887.—Bull. 111: 291.

Niagara.—A Canada variety which apparently has some good qualities. Flavor and texture good; color dark. Apparently vigorous and productive.

Olathe (Stayman's No. 5).—Originated by J Stayman, of Leavenworth, Kans., from seed of Reliance. Canes rather slender, vigorous, upright, dark red. Fruit large, firm, juicy, of good quality and color, ripening among the last; productive.

Osceola.—Originated in Osceola county, in northwestern Iowa. Said to be extremely hardy, but soft in fruit.—Mich. Exp. Sta. Bull. 111: 297.

Parry's Nos. 1 and 2.—Originated with William Parry, of New Jersey, but not considered by him worth naming and introducing. No. 1 is an early variety, of rank growth, dark foliage, fairly productive, soft, of good flavor. No. 2 later, more productive, not so rank a grower, large, firm, of distinct flavor.

Pearl (Red Pearl).—Origin unknown. Cultivated considerably about Philadelphia at one time. The plant is a very short, stocky grower, seldom over three feet high. Spines numerous, long, slender, light colored, slightly tinged with purple. Suckers very numerous. Moderately productive and hardy. Fruit medium, nearly round, bright scarlet, sweet, juicy, moderately firm, with an agreeable flavor.

Pennsylvanian.—A variety mentioned by Prince, in the Pomological Manual, as obtained from a London nursery under the name *Rubus Pennsylvanicus*, but which he had later found to be identical with plants received from the forests of Maine.

Perfection.—A variety originated by F. W. Loudon, of Janesville, Wisconsin, and said to be a cross between the Cuthbert and

the Turner. Described as productive; fruit large, handsome, of good color and flavor, juicy, not so firm as the Cuthbert.

Pomona.—Introduced by William Parry about 1887. One of the most uniformly productive varieties grown at the Geneva (N. Y.) Experiment Station. Of vigorous growth and fine appearance. Fruit a pleasing red, large and firm. Season very long.

Queen of the Market.—See Cuthbert.

Rancocas.—Introduced by William H. Moon, of Morrisville, Pa., in 1884. Originated as a seedling on the farm of J. S. Hansell, taking its name from the place of its origin, on the Rancocas Creek. An early variety of weak or only moderate growth, hardy, and fairly productive. Fruit of medium size, firm, of good color, but rather poor quality. Yields the bulk of its crop early in the season.

Re(e)der.—A seedling found near Stevensville, Mich., about 1875. Described as somewhat lacking in vigor. Canes slender, quite tender. Fruit round, only moderately firm, of good quality. Apparently never proved valuable.

Red Queen.—Mentioned by William Parry, in 1869, as no longer popular.—Gar. Month. 11: 237.

Royal Church.—Originated on the farm of Royal Church, of Harrisonville, Ohio, near where a lot of Herstine and Philadelphia varieties had been grown. Plants vigorous, productive, and hardy. Fruit very large, dark crimson, moderately firm, of excellent quality. Rather too dark in color. This may belong with the *Rubus neglectus* group.

Scarlet.—Under this name was disseminated a sort found mixed with the Allen as sent out. It was distributed by John Crane, of Union county, N. Y., who simply stated the facts, not claiming it to be a new variety. Fuller thinks it probable, from the description, that it was Allen's Prolific.

Scarlet Gem.—A seedling of the Crimson Beauty, originated by Dr. J. Stayman, of Leavenworth, Kans., in 1876. Described as early, moderately vigorous, comparatively hardy, of medium productivenes. Fruit bright red, of medium size, but deficient in quality and firmness. Like its parent, it needs to be near other varieties to insure pollination.

Stayman No. 2.—Red, hardy, equal to Crimson Beauty.—Samuel Miller, Missouri Hort. Soc. Rep. 1883: 203.

Stoever.—A form of the American Red, found wild near Lake Dunmore, Vermont, by Jefferson F. Stoever, who removed and fruited it near Philadelphia, in 1859. Described as large, roundish conical, rich crimson color, and of good flavor, with a tendency to autumn fruiting.—Hov. Mag. 1860: 124.

Talcott.—Sent out for trial by G. H. & J. H. Hale of Connecticut, in 1883. Much like Turner except in form. Plant lacking in vigor; fruit small and very early.

Thompson Early Pride.—Sent out in 1888 by the Cleveland Nursery Co. Described as upright, vigorous, hardy and fairly productive. Fruit of medium size, firm, juicy and good.

Thompson Early Prolific.—Also sent out by the Cleveland Nursery Co. A moderate grower, fairly productive. Fruit of medium size, bright crimson, quite firm, ripening early.

Thwack.—Introduced by T. W. Foster, of Louisiana, Mo., as obtained from T. S. Wilson, of New York, who claimed it to be a cross between Herstine and Brandywine. Hardy, vigorous, productive; canes stout, brownish green, with few spines. Fruit large, ovate-conical, bright red, with slight whitish pubescence. Flesh pale red, rather firm, moderately juicy, mild, not rich. Attained prominence as a market berry, notwithstanding its poor quality.

Trusty.—A variety of unknown origin, on trial in Canada. Said to be of medium size, round, dark red, slightly downy, of good quality, firm, very productive, and late. Canes resembling Cuthbert, but more hardy.—Mich. Exp. Sta. Bull. 111: 315.

Turner (Southern Thornless, Red Thornless, Southern Red, Baldwin's Choice, Balding's Choice).—Originated by Prof. J. B. Turner, of Jacksonville, Ill. A full account of its origin is given in E. P. Roe's "Success with Small Fruits." It was for a long time one of the most popular varieties, and is still much grown. Very hardy, vigorous; canes of a golden reddish brown color, overspread with a purple bloom. Almost free from spines. Fruit large, bright crimson, roundish conical, soft, sweet, and of excellent flavor. The distribution of plants by a man named Baldwin undoubtedly caused it to receive the name Baldwin's Choice, evidently corrupted to Balding's Choice.

Virginia Red.—A variety mentioned by Prince in the Pomological Manual, published in 1832.

Welsh.—A seedling raised by Isaac Welsh, of Camden county, N. J. Described as early, of medium size, bright red, firm, not of high quality. Vigorous, productive, and unusually hardy.

White-fruited.—A white-fruited form of *Rubus strigosus* was sent to the Cornell University Experiment Station, by A. S. Fuller. The plant possesses all the characters of *Rubus strigosus*, and has nothing of importance to distinguish it from that species.

Winant.—A seedling raised in New Jersey. Introduced by Frank Ford & Son, of Ravenna, Ohio. Said to resemble Thwack. A strong, vigorous, upright grower, perfectly hardy, productive. Fruit large, clear bright red, firm.

Recommended Varieties

A vote for the most thoroughly tried and generally satisfactory American red raspberries would probably result in the election of Marlboro for early and Cuthbert for late. To this should be added Golden Queen, if a yellow variety is wanted. Loudon is younger, but is pushing rapidly into the field, while Miller seems to please on the Delaware peninsula.

IV. THE EUROPEAN RED RASPBERRIES

Rubus Idæus

At the beginning of raspberry culture in the United States the European red raspberry had all the advantage of age and breeding on its side, but with the climate against it, it has lost the race. This has happened, too, notwithstanding the fact that there has been no serious difficulty in growing it here. More than one hundred varieties have been introduced, many of them having been seedlings produced in America, but in spite of that, few are now known or grown to any extent. Their quality and appearance recommends them to the amateur's garden, and it is chiefly there that they are found. The varieties of this class are usually less hardy, slightly more stocky in growth of cane, and continue to ripen their fruit through a longer season. See Section III. for a history of this type.

Varieties of the European Red Type

All Summer.—Introduced by John Lewis Childs, of Floral Park, N. Y., as having been purchased from Mrs. A. A. Stowe,

of Hailey, Idaho, who obtained it from California, though the plants came originally from Mexico. Said to be strong, stocky, vigorous and prolific, with large rank foliage, hardy in winter and summer. Fruit large, dark red, and of excellent quality. Recommended for its ability to endure extreme heat.

Alpine.—Imported from the Mediterranean with Cretan Red and Flesh-colored by William R. Prince, who believed them to be closely related.

Amazon.—Sent out from Edesville, Md., as a new variety, but thought by those who received it to be the Fontenay.

Arnold Orange (Orange King). — Originated with Charles Arnold, Paris, Ont. Canes strong, branching, yellowish brown, almost smooth, and producing but few suckers. Fruit large, somewhat shorter than Brincklé's Orange, of a darker orange color, unsurpassed for flavor. Said to be a yellow-cap crossed with *Rubus Idæus*.

Arnold Red.—Origin same as the previous; the best known of Mr. Arnold's seedlings. Hardy, vigorous, canes dark purple, somewhat drooping. Spines slightly purple, stout, quite numerous. Fruit large, red, about the size and shape of Philadelphia, but of superior flavor. Said to bear a good crop both in July and in September. Also said to be a cross between the yellow-cap, *Rubus occidentalis*, and *Rubus Idæus*.

Arnold Yellow (Yellow Canada).—Of the same origin and parentage as the two preceding. Fruit nearly white, large, and fine flavored but not equal to Brincklé's Orange. Plant of a peculiar albino appearance, quite vigorous, productive and hardy. Suckers freely. Bears early and again sparingly in autumn.—Mich. Exp. Sta. Bull. 111: 258.

Baker.—A seedling of Merveille des Quatre Saisons. Raised by Mr. Parnell, of Cincinnati.

Barnet (Cornwall's Prolific, Cornwall's Seedling, Lord Exmouth, Large Red, Barnet Antwerp, Barnet Cane).—An old English variety, said by Prince to bear considerable resemblance to the Red Antwerp, but distinguished from it by its branching canes and long, slender, reddish prickles. Said to have been raised from seed by a person named Cornwall, at Barnet, Herefordshire.

Baumforth (Baumforth's Seedling).— Originated in England from seed of the Northumberland Fillbasket. Said to be stronger, more productive, larger, and a richer crimson than its parent.

Biggar Seedling.—Raised by C. A. Biggar, of Drummondville, Ont., from an unknown European variety. Largely used as a parent variety by Professor William Saunders, of London, Ont., in producing his hybrid varieties.

Black (English Black).—Mentioned by Downing as a hybrid from England. An old variety.

Brentford Cane.—Mentioned by Prince and spoken of by Fuller as an old English variety of little or no value. Placed among the inferior varieties in the nurserymen's catalogues about 1825.

Brentford Red.—Spoken of by Prince in the Pomological Manual as a variety of excellent quality and high flavor; productive, and continuing a long time in bearing, often producing a second crop in August.

Brentford White.—Offered by Prince & Mills, Flushing, N. Y., in 1822. Doubtless an English variety, judging from its name.

Bromley Hill.—"An old red, English variety of fair quality, but not productive."—Fuller.

Burlington (Prosser).—Originated by Benjamin Prosser, of Burlington, N. J. Downing states that there was some confusion over this variety, two or three having been sent out under the name. The one they had he describes as "moderately vigorous and productive. Spines greenish white with a brown tinge, slender and more numerous than any kind we have ever seen. Fruit large, roundish conical. Grains rather small, compact, scarlet. Flesh quite firm, juicy, sweet, good."

Carter Prolific.—An English variety, with strong canes and purplish spines. Fruit large, roundish obtuse conical, deep scarlet, with slight bloom. Firm, moderately juicy, sweet and pleasant.—Downing.

Champlain.—A chance seedling found in the garden of Mr. Macomber, of Grand Isle county, Vt. Believed to be from seed of White Antwerp, which it much resembles in the character of its canes. Introduced by Ellwanger & Barry in 1892. Described as vigorous and productive, with a tendency for the bark to split and curl. Thorns numerous and small. Foliage rich green, much wrinkled. Fruit large, lighter in color and more abundant than the White Antwerp, with seeds smaller, while the drupes are fully as large. Juicy, melting, and of high flavor. Too soft for market, but a good family variety.

Charles the Bold.—Mentioned as one of Arnold's hybrids.—Mich. Exp. Sta. Bull. 111: 263.

Christine.—A very late red variety of indifferent flavor, sent out by E. P. Roe.

Clarke.—Raised by E. E. Clarke, New Haven, Conn. Described as strong, vigorous and upright. Spines purplish, rather long and stiff. Fruit large, conical, regular. Grains large, quite hairy, bright crimson. Flesh rather soft, juicy, sweet and excellent. Apparently one of the best adapted to our climate of

the foreign varieties. Said to be capable of enduring more heat and cold than most varieties. Found to be productive at the Geneva (N. Y.) Experiment Station.

Cline.—A chance seedling sent out for trial by G. W. Cline, Winona, Ont., in 1893. Fruit of medium size, red, firm, sweet, of poor quality; inferior to Turner, but very early.

Colonel Wilder.—A seedling raised by Dr. W. D. Brincklé, of Philadelphia, Pa., from seed of the Fastolf, and named in honor of Marshall P. Wilder. Foliage much crumpled, spines white. Fruit large, roundish, very delicate yellowish white or cream color, semi-transparent. One of the finest flavored raspberries, and very productive. Flesh soft.

Cope (Vice-President Cope).—Originated with Dr. Brincklé, and named in honor of Caleb Cope, vice-president of the American Pomological Society for Pennsylvania in 1852. Thomas calls it a late sub-variety of the *Red Antwerp*.

Cornish.—An English variety which Fuller speaks of as old and discarded at the time his book was written.

Cox Honey.—An old English white variety.

Cretan Red.—Imported from the Mediterranean by Prince, who says it resembles the Antwerp class in foliage, but with fewer spines. Thomas describes it as rather late, productive; canes upright, gray, nearly smooth; leaves light colored; fruit medium, roundish conical, purplish red, subacid, good.

Crystal White.—A seedling originated by A. J. Caywood, of Marlboro, N. Y. Canes vigorous; foliage deep green. Fruit light lemon color, which easily stains, and becomes worthless for market; moderately firm, of good quality and flavor. Possibly belongs to the *Rubus neglectus* class.

Cushing.—Raised by Dr. Brincklé, of Philadelphia, and named in honor of J. P. Cushing, of Watertown, Mass. Described as large, roundish conical, light crimson, regular in form, juicy, sprightly, good. Grains small and compact. Spines brownish purple, stiff and rather numerous. Dr. Brincklé said that in favorable seasons it would produce an autumn crop of fine berries.

Delaware.—Said to be an American seedling of the Hornet. A hardy, red variety, reasonably vigorous and productive. Fruit of medium size, rather soft, but sweet and delicate.

Diadem—Produced by Charles Arnold, of Ontario, by crossing the American White-cap with Franconia, a seedling of this cross with White Four-seasons, and the offspring of this by Hornet, Imperial, and Fontenay, the Diadem being one of the resulting seedlings. Described as fairly vigorous, hardy, large, red or pinkish, of good quality. Seems to have been little grown.

Double-Bearing Red (Perpetual-Bearing, Twice-Bearing, Late Liberian, Late Cane, etc.).—Mentioned by Prince and by Bridgeman. Downing says, it was formerly esteemed for its autumn bearing habit, but was then superseded by better kinds.

Downing.—A seedling of the Orange, by Charles Downing.

Duhring.—A seedling of Hornet originated by Henry Duhring, of Belmont, near Philadelphia. Little known outside of that vicinity.

Dyack Seedling.—Imported by Robert Buist, of Philadelphia, about 1840, and known only as a parent of Brincklé's Orange.—Mich. Exp. Sta. Bull. 111: 271.

Early Prolific.—An old English variety of poor flavor.—Fuller.

Emily.—One of Dr. Brincklé's seedlings which proved unworthy of attention.

Empire—A seedling of Biggar raised by Prof. William Saunders, of London, Ont. Described as early, productive, fairly vigorous. Fruit medium to large, conical, bright red, firm and of good quality.

English Cane (Twice-Bearing).—For sale by Prince & Mills, of Flushing, L. I., in 1822. Perhaps the same as Double-bearing or some of the other English varieties.

English Giant.—Imported from Denmark, by W. D. Barnes & Son, Middlehope, N. Y. On trial at the Geneva (N. Y.) Experiment Station in 1894.

English Globe.—A variety mentioned by Downing.

English White (Old English Yellow[?]).—For sale by Prince & Mills, of Flushing, L. I., in 1822 at 8 cents each. The White Antwerp sold at 25 cents each, and the American White at 12½ cents each, so this could hardly have been either of those.

Everbearing Red.—Mentioned by William Parry in 1869 as no longer popular. Also recorded as a failure in Canada.

Fastolf (Filby).—One of the best English varieties, which derived its name from having originated near the ruins of an old castle of that name in Great Yarmouth. First advertised by Yuell & Co., in the Gardeners' Chronicle in 1843. Ripens about ten days earlier than Franconia. Figured in Hovey's Magazine 1846: 299. Crozier* cites a reference which seems to indicate a much earlier origin.

Flesh-Colored (Frambosier Couleur de Chair).—Said to have been obtained by William R. Prince from the Mediterranean with the Cretan Red, which it closely resembles.

Fontenay (Belle de Fontenay, Belle d'Orleans, Amazon).—A

*Mich. Exp. Sta. Bull 111: 274.

French variety with stocky, vigorous, and somewhat branching canes, suckering abundantly, especially when young. Fruit large, roundish conical, purplish red, moderately firm, with a rich, sprightly flavor. One of the hardiest and most reliable European varieties. Crozier spells this name Fontenoy.

Four-Seasons Red (Merveille de Quatre Saisons, October Red).—A French variety having the autumn-bearing habit especially developed. Thought by many American cultivators to be the same as Fontenay.

Four-Seasons Yellow (White Four-Seasons, October Yellow).—Imported from France in 1863 by Charles Arnold, of Paris, Ont. Said to be a seedling of the preceding, and similar to it in all respects except color.—Mich. Exp. Sta. Bull. 111: 275.

Franconia (Abel, Naomi [?]).—Received from Messrs. Vilmorin, of Paris, many years ago by Samuel G. Perkins. Said to have been little known in European catalogues except as returned from this country. It was one of the comparatively well known foreign varieties on this side of the water.

French (Vice-President French).—Raised by Dr. Brincklé, from Fastolf crossed with Yellow Antwerp, and named in honor of B. U. French, vice-president of the Massachusetts Horticultural Society. Described by the originator* as follows: "A very late variety, which throws up very few suckers, and never fruits on these until the succeeding year. It is the latest and most hardy of all my seedling raspberries. It was the result of a cross between Fastolf and Yellow Antwerp. The seed produced from this cross was planted, and some twenty or more of them vegetated. Being desirous of creating new varieties with a constitution sufficiently hardy to adapt them to the exigencies of our climate, I subjected them to such severe treatment as to kill all of them but one. This one bore the hard usage well. The berry of the French is large, round, and of a deep crimson color."

French Everbearing.—Said to have been recently imported from France by California nurserymen, where it is becoming popular.

Fulton.—A seedling of the French raised by Dr. Brincklé. Named in honor of James D. Fulton, of Pennsylvania.

General Patterson.—A seedling of the Colonel Wilder raised by Dr. Brincklé, and named in honor of General Patterson, of Pennsylvania.

Genesee.—A red variety sent out by Z. H. Harris, of Rochester, N. Y. Described as a moderate grower. Foliage distinct, large

*Gar. Month. 2: 133.

and wrinkled. Fruit of large size, good color and pleasant flavor, but soft, and dropping from the plant as soon as fully ripe.

Golden Prague.—Imported from Denmark by W. D. Barnes & Son, of Middlehope, N. Y. On trial at the Geneva (N. Y.) Experiment Station in 1894.—Mich. Exp. Sta. Bull. 111: 277.

Grape (Mason's Seedling Grape).—Raised from seed by Mr. Mason, a gardener, at Charleston, Mass. Said to have been produced by crossing the Scarlet Rockingham and Red Antwerp, and to resemble the Scarlet Antwerp in fruit and plant, but to be a better bearer, with racemes or bunches of fruits like grapes, whence its name. This name seems to have appeared in various places. Quite likely it may have been applied to different plants at different times.

Heebner.—Described by John Craig, of Ottawa, Canada, as a large red berry of the Clarke and Hornet type. Of good quality, but not a good shipper. Not hardy in Ottawa without winter protection.

Henrietta.—A seedling which sprung up in Connecticut. It was introduced by G. H. & J. H. Hale, who described it as perfectly hardy, remaining green to the tips with a temperature of twenty-four degrees below zero. Also enduring the heat of summer well. A vigorous grower, suckering freely. Fruit large, of high color and firm. Said to be very similar to Fontenay.

Hornet.—A French variety raised by M. Souchet, of Bagnolet, near Paris. Introduced here by Aubrey & Souchet, of Carpenter's Landing, N. J., about 1859. Figured in the Gardeners' Monthly 1: 122.

Hudson River Antwerp (New Red Antwerp, North River Antwerp).—Said to have been obtained from England by Mr. Bridge, of Poughkeepsie, N. Y. E. P. Roe, in "Success with Small Fruits," gives a most interesting account of the rise and fall of this variety and the extent which its cultivation reached along the Hudson in its most successful days.

Huntsman Giant.—A seedling of the Franconia raised by F. W. Huntsman, of Flushing, N. Y., who grew many seedlings, hoping to gain a hardy variety equal to the more tender kinds. This was not claimed to be perfectly hardy, but to be an advance in this direction, while retaining the good quality of its parent.

Imperial.—A large French variety introduced by Aubrey & Souchet, of Carpenter's Landing, N. J.

Imperial White.—A variety catalogued by Ellwanger & Barry, in 1860.—Mich. Exp. Sta. Bull. 111: 385.

Gillard's Seedling.—An English sort of good quality.—Fuller.

Jouet.—A French variety introduced here by Aubrey & Souchet, of Carpenter's Landing, N. J.

King (Thompson's King).—Sent out by the Cleveland Nursery Co., of Rio Vista, Va., in 1892. Described by H. E. Van Deman as medium in size, round, light crimson, drupes large, few, suture plainly marked, moderately firm, juicy, subacid and good. Professor Beach says* that it shows evidence of Idæus parentage.

Knevett Giant.—Imported from England by Marshall P. Wilder in 1843, having been received as a present from Messrs. Chandler & Co., of Vauxhall, who stated that the ones they gave to Mr. Wilder were all they had ever had. They were under the impression that these were brought in by some person in that vicinity. The variety became quite popular in this country.

Lady Ann.—A seedling of Biggar Seedling, produced by Professor William Saunders, of London, Ont., and now on trial in Canada. Said to be moderately vigorous, large, firm, and of good quality.—Mich. Exp. Sta. Bull. 111: 287.

Large-fruited Monthly (Rivers's Large-fruited Monthly, Rivers's New Monthly).—Said to have been imported from the continent to England by Thomas Rivers, in 1847, and brought to this country later. Apparently it never proved valuable here.

Longworth.—One of Dr. Brincklé's Seedlings, which Fuller describes as large, round, deep crimson.

Lord Beaconsfield.—Mentioned as an English variety on trial at the Experimental Farm at Agassiz, B. C.

Lost Rubies.—A variety said to have been found growing in a bed of Naomi by A. M. Purdy, and sent to Charles A. Green, of Rochester, N. Y., who introduced it. Regarded by many as identical with Naomi. Whether this be true or not, the name "Lost Rubies" was very appropriate, for its fruit proved to be conspicuously absent, most of it being imperfect.

Magnum Bonum.—Introduced from England about 1840. Said to be similar to, if not the same as, Yellow Antwerp.

Mrs. Ingersoll.—One of Dr. Brincklé's seedlings. Large, yellow, and of fair quality.

Mrs. Wilder.—A seedling of the Colonel Wilder, similar in color. Named by Dr. Brincklé.

Muriel.—A seedling raised from Biggar Seedling by Professor Saunders. Said to be moderately vigorous, large, dark red, pointed, rather soft, of best quality, and ripening early.

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*Geneva N. Y. Exp. Sta. Bull. 91.

Naomi.—Said to have been produced from seed sown by Mrs. Governor Wood, of Rockport, Ohio, about 1850. Introduced by F. R. Elliott. The question of the identity of this variety with the Franconia was investigated by a committee of the Ohio State Horticultural Society in 1868. The fact was developed that the stock sent out from Mrs. Wood's place was very badly mixed. She grew seedlings from the Red Antwerp and Franconia, and from the mixture distributed plants. The sort which proved the best, and thus came to survive as the true Naomi, was doubtless the Franconia itself, or a seedling of it, which, as may happen with the offspring of well established varieties, was so nearly like the parent as to be indistinguishable from it.

Narragansett.—A seedling of Brinckle's Orange raised by John F. Jolls, of Providence, R. I., and reported to be large and productive. Fruit conical, scarlet, of fine flavor.

New Everbearing.—Noticed in the proceedings of the Cincinnati Horticultural Society for 1861.

Northumberland Fillbasket.—An English variety introduced about 1855.

Norwalk.—Introduced in 1879, by Mallory & Downs, of South Norwalk, Conn. Said to be bright red, fine flavored, and not crumbly. A superior variety for market and canning. Thought by Lovett to be the same as Naomi and Franconia.

Nottingham Scarlet.—An old English variety, introduced before 1850 by Marshall P. Wilder.

Orange (Brinckle's Orange).—This noted variety originated with Dr. W. D. Brinckle, of Philadelphia, in 1845. It has long stood as representing the ideal quality to be sought for in the raspberry. Roe speaks of it as a hybrid between *Rubus Idæus* and our native species. It was raised from the seed of Dyack Seedling, an English variety of deep crimson color, but what the staminate parent was does not now appear. According to Dr. Brinckle, it reproduces itself generally from seed. It is described by Roe* as follows: "It is essentially an Antwerp in character, and yet it is more vigorous, and adapted to a wider range of country than the Antwerp. The berry is of a beautiful buff color, and its delicious flavor is the accepted standard of excellence. At the same time it is known that it will not thrive under hot suns or upon light land. It can be raised south of New York only in cool, moist soils and in shady locations, but in the north, where the conditions of growth are favorable, it produces strong, branching canes, covered with white spines, and is exceedingly

*Success with Small Fruits.

productive of large, light colored berries that melt on the tongue. It always requires winter protection."

Palluau.—A French variety. Described by Downing as strong, vigorous and upright, bearing large, conical fruit, a little obtuse; bright, light crimson.

Papier.—An old French variety. Known also as Le Noire or Tue-Homme. First introduced about 1820 at Bagnolet, near Paris, the chief seat of raspberry culture for the Paris market, whence many of the foreign sorts have been obtained. It is said to have been soon superseded by other sorts because of its short fruit stalk, raspberries there being gathered with the stems attached. Introduced into the United States by Aubrey & Souchet.

Parnell.—Said to be a seedling of Merveille des Quatre Saisons, raised by Mr. Parnell, of Cincinnati.* Reported to stand the winter well, but to be easily injured by summer sun. Vigorous, productive, medium to large sized, dull red, with slight bloom, of fair quality.

Patrician.—Said to have been applied by E. P. Roe as a temporary name to a variety imported from France by Mr. Downing, the name of which had been lost. It was said to be vigorous and productive, with fruit larger than Cuthbert, and of fine flavor.

Pilate.—A French variety, introduced into the United States by Aubrey & Souchet, of New Jersey.

Pride of Kent.—Originated by Mr. Fallstaff, of Kent, England. Imported about 1887 by Henry King, of Jefferson, Colo., and introduced to public notice in 1892 by R. S. Edwards, of Highland, Colo. A typical Idæus variety. Fruit of fair size, color and flavor, but showing little evidence of productiveness.

Pride of the Hudson.—A chance seedling, which originated in the garden of T. H. Roe, of Newburg, N. Y., about 1872, and gave most unusual promise. It was propagated and introduced by E. P. Roe, but in spite of the glowing indications of its youth, it proved a failure when grown under ordinary conditions. Though apparently resisting cold without injury, it suffered under the summer sun, and soon passed out of favor. The account of its origin and subsequent downfall, as given by Roe in "Success with Small Fruits," well illustrates the fickleness which these children of the garden may sometimes show. It was described as strong, vigorous, with large corrugated leaves, very productive, of excellent quality, scarlet-crimson, but too soft for market.

Prince of Wales (Cutbush's Prince of Wales).—An English variety, mentioned by Downing as a strong, upright bush, with purple spines and large, conical crimson fruit.

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*Ohio Hort. Soc. Rept. 1869: 32.

Princess Alice.—Fuller speaks of this as a new English variety, raised by Cutbush & Son, of Highgate, England.

Prince Globose.—Raised by William R. Prince, of Flushing, L. I. Described as strong, upright, with long, stout and numerous spines, and large, dull red fruit, with a deep bloom. Flesh coarse, rather dry, and crumbling.

Prolific Red.—Described by Prince in 1832 as more dwarf than most others. Canes slender, with small, numerous spines. Fruit large, of good quality, and an autumn bearer.

Red Antwerp (Old Red Antwerp, Knevett's Antwerp, True Red Antwerp, Howland's Red Antwerp, Frambosier à Gros Fruit, Burley).—One of the oldest European varieties, probably having been in cultivation more than a century. It is supposed to have derived its name from the city of Antwerp, in Belgium, though the plant itself is said to have come from the Island of Malta. It is one of the best of the European sorts, and is still grown, even for market, in the United States. Described as having strong, long, yellowish green canes, slightly glaucous, tinged with purple, covered with dark brown bristles. Bearing wood vigorous and nearly smooth. Leaves large, slightly rugose, dark green. Fruit large, conical, dark red, rich and sweet. Many other varieties have received this name at times. It is figured in the Report of the United States Department of Agriculture for 1866.

Red Cane.—A favorite market variety at one time in the vicinity of Hartford, Conn. Introduced there without name, and was probably some well-known variety like the Hudson River Antwerp, or true Red Antwerp.—Mich. Ex. Sta. Bull. 111: 303.

Red Sweet.—Imported from Denmark by W. D. Barnes & Son, of Middlehope, N. Y. On trial at the Geneva (N. Y.) Ex. Sta. in 1884.—Mich. Exp. Sta. Bull. 111: 304.

Rivers Orange (Large Orange, Rivers's Yellow).—Raised by Thomas Rivers, of England. Described as strong, branching, with stout, greenish spines, not numerous. Fruit large, deep or pale reddish orange.

Russell Red.—Raised by Dr. G. W. Russell, of Hartford, Conn., from seed of the White Antwerp, grown near Red Cane. Bees were kept in the garden, and hence it was thought to be a cross between these two varieties. It was first exhibited before the Hartford County Horticultural Society, July 14, 1854. The account of this, given in Hovey's Magazine, 1858, p. 420, speaks of this Red Cane as "doubtless the American Red of the books."

Semper Fidelis.—An English variety, mentioned in Hovey's Magazine as new in 1863.

Sharpe.—A seedling of unknown parentage, produced by Prof.

William Saunders, of London, Ont. Described as vigorous, fairly hardy. Fruit large, bright red, soft, good quality, ripening early; similar to Heebner.—Mich. Exp. Sta. Bull. 111: 308.

Silver Queen.—A yellow variety, sent out for trial in 1885 by Robert Johnston, of Shortsville, N. Y., who obtained it from L. M. Macomber, of Vermont, under the name "Silver Skin." It proved of so little value that it never came into cultivation.

Sir John.—A seedling of Biggar's Seedling, produced by Professor William Saunders, of Ontario. On trial in Canada. Described as large, roundish conical, of good quality, but soft, ripening early.—Mich. Exp. Sta. Bull. 111: 309.

Souchetti (White Transparent).—Raised by Messrs. Souchet near Paris, and introduced in the United States by Aubrey & Souchet, Mr. Souchet of this firm being a son of the originator in France. Described as long, conical, medium to large. Fruit of a rich cream color, overspread with white bloom.

Spring Grove.—Mentioned by Fuller as an old foreign variety, very prolific, but of poor flavor.

Sucre de Metz.—A white, foreign variety introduced by L. Ritz, of Ohio, in 1869. Said to be productive and to bear autumn crops, the fruit being of fine quality.—Ohio Hort. Soc. Rept. 1869: 32.

Superb.—Mentioned by Fuller as a poor-flavored, old, foreign sort. Color red. See also Superb under Purple-cane Raspberries.

Superb d'Angleterre.—Also mentioned by Fuller. Perhaps the same as the preceding.

Superlative.—Introduced by Ellwanger & Barry, of Rochester, N. Y., in 1892. Described as hardy, with stout canes. Fruit large, conical, handsome dull red, of very fine flavor. Promising to be an improvement over other foreign varieties, and preeminently a dessert variety. Apparently like all others, however, suffering from its foreign parentage.

Surpasse Merveille.—A French variety raised by Simon Louis. A seedling of the Merveille de Quatre Saisons. Announced in French catalogues in 1862.

Surprise.—A chance seedling of the Franconia, which originated in Montgomery county, N. Y. Said to resemble Franconia in flavor, and to be firm enough to carry well.—Country Gentleman 1881: 473. See also Surprise, under Purple-cane raspberries.

Surprise d'Automme.—A white variety of *Rubus Idæus*, introduced by L. Ritz, of Ohio, about 1869. Claimed to be productive, of very delicate flavor, and to bear autumn crops.—Ohio Hort. Soc. Rept. 1869: 32.

Sweet Yellow Antwerp.—Mentioned by Downing as an old English variety, sweet, but unprofitable.

Talbot.—Originated about 1885 on the farm of J. W. Talbot, of Norwood, Mass., who had been growing Herstine and Fontenay. Described as of medium size, with large grains, soft, juicy, mildly acid. Canes strong and vigorous.

Taylor Paragon.—Mentioned by Fuller as an old, discarded European variety of poor flavor.

Thunderer.—Mentioned by Thomas as an English variety resembling Franconia.

Turkish Turban.—Mentioned in Hovey's Magazine, 1842: 368.

Vermont.—A seedling of the Champlain. Originated by L. M. Macomber, of North Ferrisburgh, Vermont. Said to be vigorous, hardy and productive. Fruit of beautiful pale yellow color, dusted with a white down; large, soft, juicy, of best quality.

Victoria (Rogers' Victoria).—Imported by William R. Prince. Described as a variety of rather dwarf habit, bearing very large and dark red fruit. Fuller gives this name as a synonym of Fontenay. According to Crozier,* this is referred to by Maynard, of Massachusetts, under the name Victor. He also speaks of Cornell's Victoria and Steel's Victoria as two other English varieties not known in the United States.

Walker.—One of Dr. Brincklé's seedlings. Described as large, round, deep crimson, soft, juicy, of sprightly flavor, and good. Canes strong, with a few stiff, purple spines. Very productive. Probably named in honor of Samuel Walker, of Boston.

Williams Preserving.—"An old English variety quoted from Johnson, in Gardener's 'Farmer's Dictionary,' N. Y., in 1846."—Mich. Exp. Sta. Bull. 111: 318.

Wilmot Early Red.—Mentioned by Fuller as an old English variety of small size and poor quality.

Woodward.—One of Dr. Brincklé's seedlings. Small, round, crimson. Very early, with red spines.

Woodward Red Globe.—Fuller speaks of this as an old English variety cultivated in England about forty years previous. It is also mentioned in Hovey's Magazine of Horticulture 1843, p. 332.

Yellow Antwerp (White Antwerp, Double-bearing Yellow.)—Described as nearly as large as the Red Antwerp, of the same shape. Flesh yellow, very tender, rich, and very sweet. Canes yellow, productive. A variety long known.

Yellow Chili (Chili Monthly).—A French variety mentioned by Fuller as having little value, being inferior to several others of the same color.

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*Mich. Exp. Sta. Bull. 111; 317.

RECOMMENDED VARIETIES

None of the English varieties can be recommended, except to the amateur who may wish to try them for the home garden, and he may as well be left to make his own selections.

V. UNCLASSIFIED RASPBERRIES

I have not been able to refer to their respective classes with any degree of certainty the varieties mentioned in the following list. Most of them are little known, many have passed out of cultivation, others may be only synonyms for better-known names, and a few are new.

Allen.—See False Red Antwerp.

Allen Red Prolific.—Same origin as the Allen. Perhaps also included under the False Red Antwerp.

Barter.—Reported from California, by Professor E. J. Wickson, as a large sized, vigorous, productive variety, first grown by William Barter, of Penryn, Placer county, Cal., to whom it was given as a "foundling." Largely grown in the foot-hill regions of that state.—Mich. Exp. Sta. Bull. 111: 259.

Beehive.—A variety introduced by Messrs. Winter & Co., of the Linnæan Botanic Garden, Flushing, N. Y. Fruit large, round, red, ripe in July.—Amer. Gards. Asst. p. 194.

Bronze Queen.—Mentioned as unproductive and only moderately vigorous.—Mo. Exp. Sta. Bull. 13 (1891).

Carleton.—Mentioned as on trial at the Experiment Station at Agassiz, B. C.

Chester—Mentioned by C. S. Malbone, of South Haven, Mich., with Brandywine, as the best raspberries.—Fruit Grower's Journal, April 1, 1893.

Cincinnati Red Antwerp.—Mentioned as grown in Wisconsin about 1874.—Mich. Exp. Sta. Bull. 111: 263. Perhaps the same as False Red Antwerp.

Cook's Seedling.—Reported by Dewain Cook, of Windom, Minn., as exceedingly hardy and very productive. Plant tall and thrifty. Fruit dark red, quite juicy, small, of inferior quality.—Minn. Exp. Sta. Bull. 9: 327.

Craig.—A seedling of unknown parentage. Originated by Professor Saunders, of Ontario, and named in honor of Professor John Craig. Described as large, rather conical, dark red, of the season of Marlboro; fairly firm, and of good quality; a good grower and prolific.—Mich. Exp. Sta. Bull. 111: 265.

Crimson Cluster.—Described as fairly vigorous, producing suckers close to the old canes. Not very productive, but large, of fine appearance, and quite firm.—Ninth Annual Rept. Geneva (N. Y.) Exp. Sta. Possibly a misnomer for Crimson Beauty.

Crimson Queen.—A variety offered by L. L. May & Co.

Early Richmond.—Mentioned in Garden and Forest, 1892, p. 458, as grown in Cayuga county, N. Y.

Early White.—Mentioned in Hovey's Magazine of Horticulture for 1837, p. 23, as a valuable variety.

Elizabeth.—One of D. W. Herstine's seedlings, which was examined and described by a committee of the Pennsylvania Horticultural Society of 1870 as follows: "Plant a very strong grower, great bearer and suckering moderately. Canes light pea-green. Foliage dark green, deeply crimped, pearl gray on the under side. Fruit very large, round, crimson-scarlet. Grains large and strongly marked. Firm, of delicious flavor, late."

Elm City.—"A hardy sort. Size and flavor much like Philadelphia. Eight to ten days later than other varieties."—Downing. "A thornless variety, vigorous in growth, hardy and productive. Fruit large, good color, firm and sweet."—Ohio Hort. Soc. Rept. 1807: 114.

English Red Cane (English Purple, False Red Cane, Allen).—Mentioned under this name and synonomy by F. R. Elliott as a variety much grown by market-gardeners in 1865. Described as having tall, bluish red canes, with a whitish gray bloom. Hardy and productive. Fruit medium to large, globular or slightly conical, dull red, with large grains, moderately firm, juicy, and pleasant, but not of high flavor.—Mich. Exp. Sta. Bull. 111: 273. Possibly this may have been the same as False Red Antwerp.

Erwood Everbearing.—On trial on the grounds of The Rural New-Yorker in 1879, and reported as one of the hardiest red varieties.—Mich. Exp. Sta. Bull. 111: 273.

Excelsior.—Said to have originated in Wisconsin. A variety of this name, perhaps the same, is reported as worthless in Ohio.

False Red Antwerp (Allen, Allen's Antwerp, English Red Cane, Kirtland).—The history of this variety, as gathered from a writer

in the Gardener's Monthly, 1862, p. 38, and one or two other sources, is in substance as follows:

In 1828, or thereabouts, an English gardener brought to Cleveland, Ohio, a variety without name. It proved perfectly hardy and productive, with fruit of good size and flavor. The Red Antwerp was then the standard variety, and the valuable qualities of this unnamed sort led to its being called by that name. Later, when the true Red Antwerp came to be known, this one took the prefix "False," and came to be one of the most valuable and popular market sorts, under the name of False Red Antwerp. Still later, there came to be three varieties distributed as this, two of them probably having originated as seedlings in the original plantation. They are described in the following words:

"Of these two seedlings, one closely resembles the parent in fruit, but the canes are slightly more downy and the tendency to sucker is about double, while, at the same time, its bearing quality is reduced about one-half. Another has canes more downy; tendency to sucker is increased, while its productive powers are indifferent. In fact, a great proportion of its blossoms are imperfect, and without close proximity to some other sort, it sets but little fruit, or, if it sets, the berry is imperfect.

"In 1850 I think it was," the writer continues, "a gentleman of Cleveland (F. R. Elliot) sent to W. H. Sotham, then an occupant of lands of Lewis F. Allen, one thousand plants gathered indiscriminately from a plantation of the False Red Antwerp raspberry. And now, having obtained and three years tested plants received by others from Mr. Allen's grounds, that person is prepared to say that the Allen raspberry embraces all the varieties enumerated under the name False Red Antwerp." This history seems to explain very satisfactorily the cause of so much confusion over the so-called Allen raspberry. The same writer continues :

"And now for a little history of the so-called Kirtland raspberry. Some years since, before nurseries were very abundant hereabouts, and people found it difficult to procure new and valuable fruit, Professor I. P. Kirtland was in the habit of distributing to his friends and the public, with a free hand, all his surplus plants of any sort. To Mrs. Follet, of Sandusky, the Professor some years since gave of the False Red Antwerp, Fastolf, and Franconia raspberries, a few plants each, the former being hardy and the latter tender. After a time the tender sorts died out, while the hardy one attracted the attention of H. B. Lum, of Sandusky, who, without knowledge of its character, but knowing that it came from the garden of Professor Kirtland, named and sent it out as a seedling of the Professor's, and under his name."

The botanical relationship of the Allen raspberry is a matter of dispute. Under date of January 1, 1893, Thomas Meehan

wrote, "I am still of the opinion that the Allen raspberry belongs to the type of *Rubus Idæus*. It certainly has no relationship with *Rubus strigosus*." On April 25 of the same year A. S. Fuller wrote, "As for the Allen raspberry there can be no question about its being a true *R. strigosus*, for it came from the woods, as Mr. Allen himself informed me, thirty years ago." It is quite evident that more than one variety must have been known under this name. If the above history showing its identity with the False Red Antwerp is authentic, we might expect it to have been an English variety, appearing as it did in the hands of an English gardener as early as 1828. On the other hand, if Mr. Fuller's information was correct, that it was taken from the woods, it must have been *R. strigosus*. It is a matter of interest in connection with its seedlings, Elizabeth, Herstine, Ruby and Saunders, and these have very generally been thought to contain some admixture of *Rubus Idæus*.

French (R. M. Conklin's).—Mentioned by William Parry, in 1869, as declining in favor.—Gar. Month. 11: 337.

Golden Alaska.—Introduced by John A. Salzer, of La Crosse, Wis., in 1891, and reported to have been found in one of the valleys of Alaska.—Mich. Exp. Sta. Bull. 111: 277.

Grant.—Mentioned in the Gardener's Monthly 1869, p. 123, as a new variety from Auburn, N. Y. Color red; size large; shape conical, ripening with Red Antwerp.

Grape Vine. Sent out in 1878 by William Holland, Plymouth, Ind., who obtained his original plants from John German, of Indiana. So named on account of the appearance of the canes and the large leaves. Ornamental, but of no value for fruit.

Hawkins Orange.—A poor fruit of no value.—William Parry in Country Gentleman 1878: 151.

Herstine.—This originated with Mr. D. W. Herstine, of Branchtown, Pa., according to whose statement it was raised from seed of the Allen raspberry, which had been planted in alternate rows with the Philadelphia. Plant a good grower, bearing early and abundantly, suckering moderately. Canes strong, of a pea green color, covered with white bloom. Spines green and not abundant. Foliage healthy, of medium size, often lobed. Fruit large, oblong, with small grains and crimson color. Flavor subacid and very good. Described by William Parry in the following words: "As large as Hornet, bright as Pearl, hardy and productive as Philadelphia, and delicious as Allen." The origin of the Allen being obscure, the classification of this variety is left in doubt. On the grounds of its originator it was a remarkable berry, but has seldom proved so successful elsewhere. It appears to be slightly deficient in pollen, which sometimes diminishes its pro-

ductiveness and causes imperfect berries. A colored plate showing fruit appeared in the Gardener's Monthly for October, 1870.

Hiram.—Sent out by W. J. Bradt, of Hannibal, N. Y. Described by H. E. Van Deman as very large, sharp, conical. Core large and rough. Not so firm as Cuthbert, but a fair shipper. Rather sharp acid, showing traces of Antwerp parentage. Said to be hardy and productive. Thought to be a cross between *Rubus strigosus* and *Rubus Idæus.*

Howell.—Mentioned by F. R. Elliott in the Transactions of the Ohio Pomological Society for 1865 as being then in cultivation.

Johnson.—Received from Cincinnati by E. Y. Teas, of Indiana, in 1875, and reported by him, after a brief trial, to be much like the Philadelphia.—Mich. Exp. Sta. Bull. 111: 285.

Keystone.—Originated with A. L. Felten, of Philadelphia, Pa. Fuller speaks of it as an excellent variety, although the canes are tender. Fruit very large, crimson.

Kirtland.—See False Red Antwerp.

Kreigh.—Brought to notice about 1880. Claimed to be of fair size, productive, hardy, of excellent quality, and firm.—Gar. Month. 22: 276.

Large White.—Mentioned as a desirable variety in Hovey's Magazine of Horticulture 1837: 23.

Lindley.—Raised by Joseph B. Lindley, of Newark, N. J., early in the sixties. Said to be a hybrid between the Fastolf and the Native Red. Described as strong, upright, much branched, tall. Spines greenish, stout, and numerous. Fruit medium to large, conical, a little obtuse, crimson. Grains medium to large, compact. Flesh rather soft, juicy, sweet, good.

Linton (Red).—Mentioned in "Rural Affairs," vol. 7, p. 81. Also by William Parry, of New Jersey, in 1870, as unsuccessful.

Little Prolific.—A red variety originated with John Little, of Ontario. Sent out in 1883. Plant hardy, slender and branching, bearing heavily. Shoots green, without spines. Fruit medium, roundish, slightly conical, purplish red, firm, juicy, acid and sprightly. No longer cultivated. Probably *Rubus neglectus.*

May Orange.—Offered for sale by L. L. May & Co.

Mendocino.—A Pacific coast variety. Said to have originated in Mendocino county, Cal., and used by Luther Burbank, of Santa Rosa, Cal., in the production of some of his seedlings and hybrids.—Mich. Exp. Sta. Bull. 111: 290.

Miller Favorite (Red).—On trial at the Michigan Agricultural College in 1887.

Mohler No. 1.—Mentioned as a red variety on trial at the

Indiana Experiment Station. Described as moderately vigorous, hardy and productive. Of good quality, and firm.—Bull. 38: 13.

My Seedling.—Mentioned by George J. Kellogg in the Report of the Wisconsin Horticultural Society for 1887, p. 241, as valuable, having withstood the winter and drought, and paid better than other varieties.

Nebraska.—Mentioned by William Parry in 1869, as no longer popular.—Gar. Month. 11: 237.

Newark.—Mentioned as on trial in 1892, at the Oklahoma Experiment Station.—Mich. Exp. Sta. Bull. 111: 294.

New Prolific.—Mentioned in the Report of the Kansas State Horticultural Society for 1884, as satisfactory in that state.

Northern Wonder.—Spoken of as an excellent variety found by one of the Feltens.—Gar. Month. 13: 246.

Phoenix.—Mentioned in The Rural New-Yorker, 1897, p. 598, as a very early red variety.

Pullman.—A variety mentioned as on trial at the New York Experiment Station about 1884.—Mich. Hort. Soc. Rept. 1884: 251.

Queen Marguerite.—A red variety on trial in Michigan about 1885. Reported as hardy, productive, of fine size and fair quality, but lacking brightness of color.

Red Cluster.—Described by T. T. Lyon in 1893 as late, of medium size, red, roundish conical, of good quality, moderately productive. At the Michigan Agricultural College it is vigorous, moderately hardy.—Mich. Exp. Sta. Bull. 111: 304.

Richardson.—Mentioned as an inferior variety cultivated in the West.—Gar. Month. 1862: 339.

Rider.—Spoken of by T. T. Lyon as not quite satisfactory in plant but beautiful and good.—Amer. Pom. Soc. Rept. 1891: 119.

Riley's Early.—Downing speaks of it as a variety from New Jersey. Of medium size, good flavor, and quite early.

Ruby.—Raised by D. W. Herstine. Described as a free grower and abundant bearer. Canes strong, of a light green shaded with purple, covered with white bloom, and with very few spines. Foliage healthy, light green, pearl gray on the under side. Fruit large, round, dark crimson, with large grains, somewhat hirsute. Flavor somewhat acid, excellent.

Saunders.—Originated with D. W. Herstine, of Branchtown, Pa., who raised it from the seed of the Allen planted in alternate rows with the Philadelphia. It was named in honor of William Saunders, of Washington, D. C. Described as a good bearer, suckering freely. Canes green, shaded with purple. Spines numerous, small and light green. Foliage light green and abun-

dant. Fruit very large, round, crimson, with large grains. Flavor of high character and delicious.

Short-jointed Cane.—Described by Prince, in the Pomological Manual published in 1832, as almost spineless, with close, jointed canes Fruit pleasant, rather larger than the Common Red, but not quite equal to the Tall Red Cane, though superior to it in flavor; later in ripening than the Common Red, producing good crops. Crozier refers it to *Rubus strigosus.*

St. Louis.—A popular variety in the vicinity of St. Louis, Mo., about 1867. Said to be hardy, large, bright red, sweet, and of excellent flavor.

Tall Red Cane.—Described by William Prince, about 1832, as productive. Fruit round, of good size and quality, but not of high flavor. Canes covered at the base and extremities with numerous fine spines or hairs. It is also mentioned by Bridgeman in the "American Gardener's Assistant."

Victor (Red).—Tender and unproductive, fair to poor quality.

Watson Seedling.—Inquired about in the Gardener's Monthly, vol. 1, p. 139, but unknown to the editor.

Wauregan.—Mentioned in "Rural Affairs," vol. 8, p. 81. A failure with William Parry, of New Jersey.

Waterloo.—Mentioned among the varieties planted for trial at the Mississippi Agricultural College in 1888.—Mich. Exp. Sta. Bull. 111: 318.

White Canada.—Raised by Charles Arnold, of Paris, Ontario. Canes vigorous, upright, brownish yellow. Spines white, quite stout, numerous. Fruit about the shape of Brincklé's Orange. Pale yellow, of decided Antwerp flavor.

White Mountain (Red)—Tender, late, unproductive, rather soft, and of poor quality.—Mass. Hatch Exp. Sta. Bull. 21: 10.

Recommended Varieties

None of the varieties mentioned in this list are of sufficient prominence at the present time to deserve recommendation.

CHAPTER VIII

VARIETIES OF BLACKBERRIES AND DEWBERRIES

A. THE BLACKBERRIES

The blackberry family is an exceedingly variable one, and within the limits of the species to which it belongs, and those species closely related to it, may be found an almost endless variety of forms. Many of these produce fruit of desirable size and quality, and it is by no means certain that we have as yet secured the most desirable ones for cultivation. All our common high blackberries belong to the species known as *Rubus nigrobaccus* and *R. argutus*. In typical forms, the former is characterized by vigorous, upright, thorny bushes, bearing numerous glandular-tipped hairs on the peduncles, petioles and other young parts of the plant. Forms occur, however, which are almost destitute of thorns, or of glands, or of both. Several botanical varieties belonging to this species have been named, and no one can say how many more might be recognized with equal propriety if the forms could be all collected for study. The typical form of the species bears long or oblong fruit, comparatively sweet and rather dull in color. *Rubus argutus* is much like this common blackberry, but lacks the pubescence.

A closely related, and perhaps equally common species, at least on high land, is the Mountain Black-

berry, *Rubus Canadensis* (*R. Millspaughii*, Britt). In this species the main canes are almost wholly destitute of thorns, the fruit is apt to be sour, sometimes even bitterish, and is much shorter and thicker, with larger, glossy black drupelets. Whether seedlings of this species can be acclimated to lower altitudes without acquiring to a degree the objectionable thorny dress of their lowland neighbors, has yet to be determined. Indeed, it may be fairly questioned whether it is worth while to make the attempt, since the fruit is generally considered inferior to that of the Long Blackberry. Still, this inferiority is not great, and if, by crossing this species with our commoner garden varieties, the thorns can thereby be reduced, the object is well worth the seeking. The fruit ripens later, but this is doubtless chiefly due to elevation. This type reaches its greatest perfection in the high mountains of the Appalachian system. It is often found in dense forests, where the canes sometimes reach a height of fifteen or eighteen feet, and are as thornless and smooth as a willow twig. In such localities the fruit is said to be greatly appreciated by the mountain bears, which are enabled to draw down the smooth canes and fatten upon the berries for their long hibernating sleep during winter. Where is the philosopher who is ready to construct a theory on the disappearance of thorns as the result of the silken touch of Bruin's breast as he and his ancestors have yearly sought this autumn feast!

Still another species which produces fruit of excellent quality is the Sand Blackberry, *Rubus cuneifolius*,

of the southern states. The characters of this are in strong contrast to those of the one just mentioned, for it is a short, stubby plant, bristling all over with stout hooked thorns, and with a decidedly woolly coat on the under surface of its small wedge-shaped leaflets. In spite of its rugged appearance, it does not endure our northern winters well, and may never become a serviceable member of the family except in the sunny clime of its choice.

Were it not that the legend of the man of wondrous wisdom, who jumped into a bramble bush and scratched out both his eyes, doubtless had its origin in the dim history of the Old World, we might imagine this to have been the species concerned, for no American bramble appears to be better able to accomplish such a feat!

The following sketch of blackberry history was once contributed by the writer to The American Garden:

History and Future of the Blackberry

The blackberry or bramble of Europe (*Rubus fruticosus*) does not appear to enjoy a very high reputation in its native country for the value and quality of its fruit. It is occasionally spoken of as being useful for tarts or similar culinary preparations, especially if liberally supplemented with apples to give spice and flavor. It is also brought forward as deserving of notice because it offers a cheap source of food in the shape of jam, etc., for the poor, either to be obtained for themselves or for the more wealthy to provide in anticipation of distributing to them as necessity may demand. The plant, evidently, even to a greater degree than in our own country, partakes too much of the nature of a troublesome weed to become popular with the more fastidious. In addi-

tion to this fact, the fruit is not equal in flavor and quality to that of our own species. Several passages in Shakespeare serve to give a good idea of the social rank of the English blackberry:

Falstaff.—"If reasons were as plenty as Blackberries, I would give no man a reason on compulsion."
—*1st Henry IV., Act ii., Sc. 4.*

Falstaff.—"Shall the blessed sun of Heaven prove a micher and eat Blackberries?"
—*1st Henry IV., Act ii., Sc. 4.*

Thersites.—"That same dog-fox Ulysses is not proved worth a Blackberry."
—*Troilus and Cressida, Act v., Sc. 4.*

In its early history, other qualities seem to have been considered more important than its fruit. According to Pliny, the ancients were taught by means of the bramble bush how to propagate trees by layers. It was, no doubt, held in greatest esteem, however, for its supposed medicinal qualities. "The berries," says Pliny, "are the food of man, and have a dessicative and astringent virtue, and serve as a most appropriate remedy for the gums and inflammation of the tonsils." Both the flowers and berries were thought by the ancients to be remedies against even the most venomous serpents. Pliny further states that "the juice pressed out of young shoots, and reduced to the consistency of honey, by standing in the sun, is a singular medicine taken inwardly, or applied outwardly, for all diseases of the mouth and eyes, as well as for the quinsy." The roots, boiled in wine, were esteemed one of the best astringents by Roman physicians, and used in all diseases of the mouth. The leaves, pounded and applied to ringworms and ulcers, were said to bring speedy relief. Boerhave, a renowned physician at the beginning of the last century, affirms that the roots, dug in February or March and boiled with honey, are an excellent remedy against dropsy. In a work entitled "A Niewe Herball, or Historie of Plantes," first written by D. Rembert Dodoen, physician to the German emperor, and afterward translated into French, then from French into English by Gerard Dewes, in 1578, the "nature" of the blackberry is set forth as follows: "The tender springes and new leaves of the Bramble are colde and drie almost in the thirde degree, and

astringent or binding, and so is the unripe fruite. The ripe fruite is somewhat warme and astringent, but not so much as the unrype fruite." Then are given a long list of "vertues," among which are the following: "They do also fasten the teeth, when the mouth is washed with the juyce or decoction thereof. The unripe fruite is good for the same purpose, to be used after the same manner." "The leaves be stamped & with good effect are applyed to the region or place of the stomacke against the trembling of the hart, the payne & looseness or ache of the stomacke." It is to be feared that Pliny and others of these old writers do not rank high as medical authorities at the present day, yet the plant and fruit of the blackberry are still employed in various ways, with very gratifying results, in the treatment of disease. According to legend, the origin of the disagreeably thorny character of the blackberry, as told by Waterton, was on this fashion: "The Cormorant was once a wool merchant. He entered into partnership with the Bramble and the Bat, and they freighted a large ship with wool; she was wrecked and the firm became bankrupt. Since that disaster the Bat skulks about till midnight to avoid his creditors, the Cormorant is forever diving into the deep to discover its foundered vessel, while the Bramble seizes hold of every passing sheep to make up its loss by stealing the wool."

Perhaps it would be casting discredit on the worthy ancestors who braved so many dangers in the settlement of our country, to charge them with undue conservatism, yet it can hardly be doubted that men who would brave the uncertainties, not to say terrors, of an ocean voyage on an almost unknown sea, and the settlement of a new country peopled with savages of unknown traits and tendencies, rather than surrender ideas which they cherished, would not be quick to form new ones. Hence we can readily conclude that the blackberry of America was to them much what the blackberry of England had been—simply a wild bramble, to be destroyed when possible and replaced by something better, and whose fruit was to be gathered at will. Moreover, to cultivate a fruit which was so readily obtained in abundance for the gathering, would have been folly to them, when many other things conducive to their safety and comfort were so

much more needed. As time went on, however, this gratuitous feast of nature, provided for the fostering of "infant industries," began to diminish, and the demand of growing cities for increased quantities of fruit doubtless led to the idea of cultivating the blackberry among the rest. Just when this state of affairs was reached it is impossible to say, but evidently not until quite late in our national development, for the blackberry does not seem to have begun to receive much notice or to be talked about in the horticultural journals until about 1850. From *Hovey's Magazine of Horticulture*, it appears that Capt. Josiah Lovett, of Beverly, Mass., figured prominently in introducing it to cultivation. Even then, as with many other good and useful things, first impressions were unfavorable. Of course, the first effort would naturally be to bring plants, which bore the most promising fruit, from the woods and clearings and set them in the garden. This attempt to tame the wild protegé of the forest did not often prove satisfactory. These plants evidently did not take kindly to the refinements of civilization, and longed for their free and easy life of the wood. Capt. Lovett reports repeated failures in trying to get good berries by this method. He persevered for five years, but at last gave up in despair about 1840, and surrendered this wild gypsy of the fruits to its native haunts as untamable. In spite of these discouraging results he evidently did not abandon the dream of a cultivated blackberry, for Downing gives him the credit of having introduced the Dorchester, which in time proved so valuable, although according to Marshall P. Wilder, as reported in the "Transactions of the Massachusetts Horticultural Society" for 1883, p. 129, it was brought to notice by Eliphalet Thayer, who first exhibited it before that society, August 7, 1841.

But these first introductions to cultivation, the Dorchester and Lawton, were not calculated to bring swift and lasting popularity to the blackberry as a garden fruit, for although large and attractive, their habit of turning black before they are ripe nearly always led to their being gathered and eaten while green, and their consequent condemnation as sour and poor in quality. Moreover, their culture, being little understood, led to frequent failures and unsatisfactory results, while their propensity to per-

sist and spread, aided by their unmerciful thorns, conspired to render them a terror to many timid gardeners. In spite of all this, the blackberry has steadily pushed its way into prominence, until it is to-day one of our most satisfactory and profitable crops. Here, as with all other fruits, we are far from attaining perfection. We have no ideal variety. If we demand the best in point of hardiness, we must yield in size and quality; if delicacy of flavor is the desideratum, something else will be deficient. Yet to stand by a well-grown row of Early Cluster, for example, to see its glistening sprays of glossy black hanging in such graceful profusion, to gather its magnificent berries and to test their sweet and melting quality, just like those finest and ripest ones we used now and then to chance upon in some wooded nook which everybody else had missed, is to forget for the time being that anything further is to be desired in a blackberry. Still we have reason to hope that the achievements of this energetic and vigorous pomological youth are but an omen of what is yet to come.

There are several distinct types of blackberries in cultivation, but to properly classify all varieties under these types is manifestly impossible, since the varieties themselves are not accessible for comparison, many of them having already disappeared from cultivation, while others are yet too new. Descriptions seldom furnish sufficient data upon which to determine such matters. Still it may be advisable to carry the classification as far as possible, as a matter of aid to future study by those who have opportunity to do it.

This inventory aims to include descriptions of all varieties of blackberries and dewberries which have been mentioned as cultivated in North America up to the close of 1897. They are classified as follows:

I. Long-cluster blackberries.

II. Short-cluster blackberries.

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III. Leafy-cluster blackberries.
IV. White blackberries.
V. Loose-cluster blackberries.
VI. Sand blackberries.
VII. Northern dewberries.
VIII. Southern dewberries.
IX. Western dewberries.

I. The Long-cluster Blackberries

Rubus nigrobaccus

The form which has somehow come to represent in our minds the type of the species to which most of our blackberries belong is designated by Professor Bailey (Cornell Univ. Expt. Sta. Bull. 99:428) as the "Long-cluster blackberry." This is the commonest form of the wild blackberry found in low lands throughout the eastern states. The berries are long and cylindrical or thimble-shaped, with dull black drupelets, rather small and closely packed on the receptacle. Each berry is borne on a long, slender stem, which stands out sometimes almost at right angles to the main stem, and the clusters are long, open and leafless. The leaflets are rather long-stalked, evenly and finely serrate, and generally with a very long tapering point.

Probably the best known representative of this class in cultivation is the Taylor, though the Ancient Briton and the Early Cluster also belong here.

As a matter of convenience, all varieties which it is impossible to definitely classify at present are mentioned here, though many of them, doubtless, belong else-

where, especially in the "short-cluster" group. Those which can be definitely referred to the "long-cluster" class are so marked.

Allen.—Received at the United States Department of Agriculture in 1894, from W. B. K. Johnson, Allentown, Pa., and described in the report of the Pomologist for that year. Said to be very productive, stronger than Kittatinny, with less thorns. Fruit medium to large, irregular, oblong or oval, glossy, jet black, not fading; seeds small, very tender; flesh firm, compact, very juicy; shipping quality good; flavor mild, sweet, with hardly enough acidity; quality good, ripening about with Early Harvest.

Ancient Briton. (Long-cluster type.)—Much confusion exists regarding the origin of this variety. According to one report it was named by Robert Hassell, of Alderly, Wisconsin, who received it from England. Another report credits it with being a Wisconsin seedling, found by one A. H. Briton, for whom it was named, the name later becoming changed to Ancient Briton. According to Professor Budd, the first mention of the variety is found in the Report of the Wisconsin Agricultural Society for 1869, p. 475. The plant belongs to an American species of blackberry, whatever its origin. It has proved one of the most valuable sorts grown in Wisconsin, being the favorite at the famous Thayer Fruit-Farm at Sparta. The bush is sturdy, hardy and very productive. Fruit medium to large, long, melting, of fine flavor and ripening about with Snyder. One of the best varieties where it succeeds. It does not thrive as well in all parts of the country. In Rhode Island it seems to demand pollination from other varieties.

Bangor.—A variety of Maine origin. It was first propagated from plants growing on the farm of Henry W. Brown, in Newbury. It is said to be hardy and a desirable variety.—Agr. of Maine, 1888:125.

Banton (Seedling).—A variety, said to be from Vermont, which proves very hardy in Minnesota. Productive, stout and good.—Minn. Hort. Soc. Rept., 1874:57.

Barnard (Long-cluster type).—Said to be a seedling of the wild blackberries of Belmont county, Ohio, taken to Allamakee county, Iowa, and disseminated by Mr. Barnard. A popular variety in northern Illinois and Iowa, where it has proved very hardy. Not a vigorous grower, throwing up few suckers; leaves large resembling wild varieties. Fruit similar to Taylor in size and form, of fair quality, and ripening late. From the description it evidently belongs to this group.

Bonanza.—Said to be hardier than the Kittatinny, about as

large, though scarcely as sweet, and about as productive; ripening a little earlier than Kittatinny. Not of great value.

Brandenburg.—Mentioned in Hovey's Magazine, 1868, p. 286.

Cape May.—"Fruit large, black, sweet, quite soft, loses color soon after gathering, not valuable."—Downing.

Carlo.—A variety growing at the Geneva (N Y.) Experiment Station, which appeared vigorous, but not productive, much of the fruit being imperfect. Also lacks hardiness.

Cherry Valley.—A variety which originated near Cherry Valley, Ill.—Ill. Hort. Soc. Rept. 1882: 284.

Clark.—Mentioned in The Rural New-Yorker for 1897, p. 598, as received from Matthew Crawford the spring previous. The growth was vigorous and the few berries received were large, black, glossy, melting and juicy.

Cumberland.—A variety chiefly known about Bridgeton, N. J. Plant hardy and productive; fruit of medium size, black, sweet and good. Early, and matures the whole crop in a short time.—Fuller.

Cutter Mulberry.—Introduced by G. B. Cutter, Newton, Mass., about 1859. Fruit long, slender, remarkably sweet, very productive.—Hov. Mag. 1859: 397.

Dallas.—A Texas variety, found hardy, vigorous, productive and reliable there, but of little value in the North.

Dehring.—An early variety, about equal to Brunton in hardiness and productiveness; fruit small.

Dodge Thornless.—Mentioned in the Secretary's report, Agr. of Mass., 1868-9, p. 72, as a variety almost free from thorns.

Duncan Falls.—Introduced by J. C. Neff, Duncan's Falls, Ohio. An upright, very vigorous grower. Fruit large, black, moderately firm, juicy, sweet.—Downing.

Early Cluster (Long-cluster group).—The original plant was discovered about 1872, among Missouri Mammoth, on the farm of Charles W. Starn, in Southern New Jersey, where it attracted attention from its early and profuse bearing, and was transplanted and propagated for market. It is a moderate, erect, healthy grower, hardy and extremely productive. The fruit is medium sized, short-oblong, shining black, sweet and of fine quality, without hard or bitter core. The entire crop ripens within a few days, making it a very desirable early market berry. This is a variety of ill repute in many sections, but on the grounds of the Cornell University Experiment Station it is one of the finest blackberries grown and the most uniformly productive. Either spurious stock has been sent out under this name, or the variety is extremely local in its adaptations, as reports from the Geneva

(N. Y.) Experiment Station, only forty miles away from Cornell, are unfavorable. For myself, I have never seen a more satisfactory blackberry, nor tasted one of finer quality, than the Early Cluster as grown at Cornell.

Eldorado.—Originated as an accidental seedling in Preble Co., Ohio, near a village of that name, and first placed under cultivation about 1882. Medium to large fruit of excellent quality, oblong, conical, irregular, with very large drupes and small seeds and core. Claimed to be hardy and productive.

Excelsior.—Productive, of fair quality, good size, season medium; lacks hardiness.—Mass. Hatch Exp. Sta. Bull. 6:4.

Farley.—Origin unknown. Fruit nearly as large as New Rochelle, sweet, and ripens two weeks earlier.—Horticulturist.

Felton.—Introduced by Oscar Felton, Camden, N. J. Rather spreading in habit of growth; fruit large, long, slightly conical, sweet and good. Ripens early and is moderately productive, but with berries often very defective.—Fuller.

Freed.—A variety originated about 1871 by George Freed, of Columbiana Co., Ohio. A rank, upright grower, with few spines and very hardy. Berry small to medium, oblong, juicy, of good quality, ripening with Snyder. A shy bearer, and not to be recommended.

Gainor.—Large and productive, but not sufficiently hardy at Ottawa, Canada.—Rept. Can. Exp. Farms, 1889: 95.

Grape.—Mentioned in the discussion of the American Pomological Society as a variety with strong canes and large fruit.—Am. Pom. Soc. Rept. 1860: 76.

Haley.—A dwarf variety, found growing along the prairie ravines of Franklin Co., Kansas. It was first brought under cultivation by E. Haley, about 1880. Fruit medium size and excellent quality.—Kan. Hort. Soc. Repts. 1884: 50—1885: 81.

Hoag.—I have the history of this variety from A. W. Sias, of Pueblo, Colorado, formerly of Minnesota, who says that it originated many years ago with Charles R. Hoag, who was one of the original members of the Minnesota Horticultural Society, and who then lived at Kasson, Dodge Co., Minn. The variety was named for him by the society. Mr. Sias says that it was very productive on the grounds of the originator, but did next to nothing on his more open grounds.

Holcomb.—First brought to public notice at one of the weekly exhibitions of the Hartford Co. (Conn.) Horticultural Society, in the summer of 1855, by E. A. Holcomb, of Granby, Conn. The fine appearance and flavor of some of the berries growing wild upon a hillside of his farm induced him to transplant some of

the best of the bushes to his garden. The comparative merits of the fruit after three or four years' successive exhibition warranted the society in giving it a name. Canes dark brown, moderately stout, long and thrifty, but not rampant; productive and hardy; fruit of medium size, oblong, sweet and high flavored, early, and continuing to ripen for a long time.

Hoosac Thornless.—Found in the Hoosac Mountains of Massachusetts. Its chief recommendation is the absence of thorns. Fruit not large, but said to be productive and of good quality. It is quite possible that this variety belongs to the true thornless group, *Rubus Canadensis*. Its thornless character and its original mountain habitat would point in this direction.

Idaho Climbing.—Mentioned in Hovey's Magazine, 1868, p. 285. It may have been the cut-leaved blackberry or a western dewberry for all we know now.

Jordan.—A variety recently introduced by J. W. Austin, Pilot Point, Texas, a native of that state. Described as a very strong grower, hardy, and remarkably productive. Fruit large, of fine flavor, ripening ten days later than Dallas and Early Harvest.

Knox.—Vigorous, large, about as hardy as Kittatinny, of good quality but lacking in productiveness.

Lincoln.—A wild plant found about two miles from President Lincoln's monument, near Springfield, Ill. A vigorous, upright grower, with long spines, hardy, a little later than Snyder. Fruit large, oblong, glossy, juicy, of good quality; grain and seed large.

Luther.—A new variety sent out by R. D. Luther, Fredonia, N. Y. Said to be vigorous, hardy and promising.

Mason Mountain.—Introduced by R. O. Thompson, of Nebraska, about 1865. Fruit large, conical, black, sweet, rich, resembling Lawton.—Hov. Mag. 1865: 122.

Maxwell.—Introduced by A. C. Maxwell, Chanute, Kansas. Described as very large, sweet, rich, luscious, melting, and very productive, ripening with Early Harvest. Bush a low, strong, stocky grower. Not hardy in Pennsylvania.

McCracken.—Found in an Illinois wood by Mr. McCracken. Hardy, early and of good quality, but small. Of little value.

Missouri Mammoth.—Disseminated from Northern Missouri. A moderate, upright grower, not entirely hardy, and a shy bearer, not all blossoms setting fruit, and some imperfect. Berry large, oval, of fair quality; grain and seed large. A little later than Snyder. Of little value.

Mountain Rose.—Mentioned in the report of the Kansas Horticultural Society for 1886, p. 297.

Nevada.—Said to be about equal to Minnewaski in hardiness, quite productive, of fair size and excellent quality. Has not proved valuable in Michigan.

Ohmer.—A seedling found by N. Ohmer, of Ohio. Said to be hardy, healthy and productive. Fruit large, firm, no core, and sweet before it becomes soft. Ripens with Taylor.

Ozark.—"Better than either Snyder or Taylor, and more productive."—Mo. Hort. Soc. Rept. 1883: 79.

Parker Early.—Mentioned in Hovey's Magazine, 1868, p. 286.

Parnell.—A variety originated by Mr. Normand, of Marshville, Louisiana.—La. Exp. Sta. Bull. 3, 2d series.

Piasa.—Sent out by E. A. Riehl, Alton, Ill.

Red Hybrid. Mentioned in "Experiments and Public Work of the Colorado Agr. College," 1884, p. 15.

Reyner.—Plants rather large and vigorous, producing large, greenish canes with few prickles. Fruit above medium, roundish or oblong, with large grains, sweet, of good flavor and quality.—Geneva (N. Y.) Exp. Sta. Bull. 81: 582.

Role Early.—Mentioned in the report of the Kansas Hort. Soc. for 1887–8, p. 482.

Sable Queen.—Introduced by J. W. Manning, Reading, Mass., and described by him as equal to Dorchester or New Rochelle in size, beauty and fruitfulness.—Downing.

Sadie.—Sent out from Iowa under the claim that its cells were so arranged as to resist very low temperatures. Matthew Crawford reports that it made a very poor growth, and produced no fruit.—Ohio Hort. Soc. Rept. 1888.

Sinclair —Mentioned in Hovey's Magazine, 1868, p. 285.

Stayman Early.—Introduced by A. J. Stayman, Leavenworth, Kansas, who speaks of it as very early, of excellent quality and productive. It has not proved valuable in the eastern states.

Taylor (Taylor's Prolific). (Long-cluster type.)—Introduced by Mr. Taylor, of Spiceland, Henry Co., Indiana, about 1867. It has peculiar greenish yellow, round canes, which are somewhat slender and trailing in young plants. It is very hardy, vigorous and productive. The fruit is large, roundish-oblong or thimble shaped, soft in texture, juicy, very mild and rich. It ripens late, about two weeks after Snyder. All in all this is one of the best varieties I have known. With Early Cluster to open, and Taylor to close the season, there is little left to be desired in regions where these varieties succeed.

Tecumseh (Long-cluster group).—A variety of the Taylor type which originated in Western Ontario. It proved to be less

hardy than Taylor and not of sufficient value to insure its continuance in cultivation.

Texas Early (Crandall, Crandall's Early).—Said to be large, fine flavored and firm, ripening two weeks earlier than Lawton, and less seedy. Has not proved valuable at the North.

Truman Thornless.—Received at the office of the United States Pomologist in 1892, from G. P. Peffer, Pewaukee, Wisconsin, and mentioned in the report of that year, p. 264. Said to be nearly thornless, as hardy as Snyder, earlier and better. Fruit medium to large, oval, dull in color, firm, sweet, good.

Wachusett.—Found growing wild on Monadnock Mountain, in Massachusetts. A slow grower, upright at first but drooping later, spines few and small. Fruit clusters few and small; berry small, round, moderately firm, of good quality. The plant is such a shy bearer that it has no practical value. This variety was figured in Tilton's Journal of Horticulture, Vol. IV., p. 220, but the drawing is not sufficiently accurate to determine its parentage. The leaves are peculiarly wrinkled at the edge, a character quite distinct. It may possess an admixture of *Rubus Canadensis* blood.

Wallace.—Introduced by Mr. Wallace, of Wayne Co., Indiana, about 1862. The plant is of stocky, upright growth, with broad round leaves resembling those of Snyder, ripening a week later, hardy and productive. Fruit as large as Lawton, of excellent flavor.

Warren.—Fairly hardy and quite productive. Berry about like Snyder in quality and size. Ohio Exp. Sta., Vol. II., Bull. 4, p. 108.

Wapsie.—An Iowa variety, mentioned as on trial and proving very hardy thus far.—Rept. Ohio Hort. Soc. 1888:192.

Washington.—Raised by Prof. C. G. Page, Washington, D. C. Fruit large, black, sweet and good.—Downing. Mentioned as new in Hovey's Magazine, in 1859.

Weston.—Originated with Adrian Durkes, of Weston, Mo., who considered it more productive than Newman or Lawton.—Gar. Month. 12:371.

II. The Short-cluster Blackberries

Rubus nigrobaccus, var. sativus

This class includes the commonest form of cultivated blackberry. It differs from the other class chiefly in the fact that the fruits are shorter and

thicker, while the drupelets are larger, not so closely packed nor so evenly arranged, and are more glossy black in color. The clusters contain fewer fruits, these being more closely crowded toward the top, and borne on stems which are more oblique and stouter. The leaflets are broader, not so long-pointed, coarsely and unevenly serrate or even jagged. There is a tendency among varieties of this class to produce a few late fruits on young shoots thrown up from the root. The form is found wild in open, dryish places, making a low bush some two or three feet high.

Agawam.—Found growing wild in a pasture about 1865 or 1870, by John Perkins, of Ipswich, Mass. Plant hardy, vigorous, and productive. Fruit oblong, of medium size, large, black, sweet, and melting to the core, ripening early, or in mid-season. A popular variety, which is not only hardy, but resists drought.

Black Chief.—On trial at the Geneva (N. Y.) Experiment Station. Received from J. H. Haynes, Delphi, Ind.

Erie (Uncle Tom).—A seedling which came up in a small vineyard belonging to L. B. Pierce, of Tallmage, Ohio, in 1876. A patch of Lawton and Kittatinny grew near by, and it probably came from seeds of these, carried by birds. Its resemblance to the Lawton indicates that as its parentage. The variety was sold to Matthew Crawford, in 1884, he in turn selling it to J. T. Lovett, who offered it for sale in 1886. Mr. Lovett first announced it under the name of Uncle Tom, but this name was so strongly objected to by Marshall P. Wilder that it was dropped, and the name Erie substituted, which is the only one under which it was ever offered for sale. A strong, spreading grower, very thorny, productive, but lacking in hardiness in some sections. Season intermediate. Fruit large, roundish oval, of good quality.

Ford No. 1.—On trial at the Geneva Experiment Station.

Fruitland.—A new variety from Ohio. Canes strong, upright, grooved, with greenish red bark. Fruit medium, nearly round, with medium large grains, sweet, good.—Geneva (N. Y.) Exp. Sta. Bull. 81.

Kittatinny.—Found in the town of Hope, N. J., near the base of the Kittatinny Mountains, and introduced by E. Williams about

1865. Plant fairly hardy and productive. Fruit large to very large, roundish conical, rich glossy black, moderately firm, juicy, sweet, and well flavored, ripening early and continuing long in bearing. Very susceptible to attacks of red rust.

Lawton (New Rochelle, Seacor's Mammoth).—Found by Lewis A. Seacor, in New Rochelle, N. Y., and brought to public notice largely by William Lawton, of the same place, about 1848. Vigorous, hardy and productive, with strong spines. Fruit very large, oval, and intensely black when fully ripe. It is then juicy, soft, and sweet, with an excellent flavor, but when gathered too early, very sour and insipid. This was the second blackberry introduced into cultivation, and it did much to popularize the fruit.

Lovett.—Described as remarkably hardy, vigorous and productive. Fruit large, mostly globular, drupes large, quite firm, though juicy, rather sweet than sour. Not very early.

Mersereau. Originated with J. M. Mersereau, Cayuga, N. Y. It resembles the Snyder, but is larger, of better quality and less likely to turn red after being picked. Very promising.

Minnewaski.—Originated and introduced by A. J. Caywood, of Marlboro, N. Y. A good grower, erect, branching, strong. Canes grooved, and thickly covered with long, straight spines. Hardy and productive. Fruit clusters large; fruit very large, long, dull in color, and somewhat hairy in appearance, of fair quality. This variety did well in its original home, but was often disappointing elsewhere. There has been much discussion over the name of this variety. The introducer insisted that it be spelled as above.

Sanford.—A new variety received from New York. Not yet fruited.—Mich. Exp. Sta. Bull. 118: 17.

Snyder.—This is the best known of all blackberries. What the Baldwin is to the apple in the Eastern states and the Ben Davis in the West; what the Concord is to the grape; what the Lombard is to the plum, the Snyder is to the blackberry. It originated as a chance seedling, on or near the farm of Henry Snyder, near La Porte, Ind., about the year 1851. It is a vigorous, strong, upright grower; very hardy and productive. Fruit of poor quality, medium size, nearly globular, of good appearance and a good shipper. The berries have a strong tendency to turn red after picking, especially if exposed to sunlight.

Stone Hardy.—An Illinois variety of spreading habit, with its fruit mostly hidden beneath the foliage. Hardy, maturing its wood early on suitable soils. Fruit rather small, roundish, black, soft, very juicy, mild, and very pleasant in flavor. Often overbears, and needs vigorous pruning.

Success.—Very productive, plants moderately vigorous, canes of

a greenish color, grooved, bearing abundant prickles. Berries medium to large, roundish, with medium to large grains, good in flavor and quality.—Geneva (N. Y.) Exp. Sta. Bull. 81: 582.

Western Triumph.—A chance seedling found upon the open prairie, in Lake county, Illinois, in 1858, by Mr. Biddle, of Muskegon, Ill. Fruit medium to large, very abundant, roundish, elongated, obtuse in form, granules coarse, large, apparently firm, yet very rich and sweet, carrying well, and without any harshness of core, like Lawton. Leaf broad and thick, irregularly and coarsely serrate; spines abundant, stiff and strong.—Tilton's Jour. of Hort. 4:44. (From F. R. Elliott, in The Rural New-Yorker.) Lacking in hardiness, and inclined to overbear.

Woodland.—Plants thrifty, productive, with abundant small prickles. Fruit medium or above, roundish, with large to very large grains; flavor and quality good.—Geneva (N. Y.) Exp. Sta. Bull. 81: 582.

III. The Leafy-cluster Blackberries

Rubus argutus

This was the first type of blackberry to be brought into general cultivation, since it is to this class that the old Dorchester belongs. The type is characterized chiefly by the fact that the leaves extend up the stem into the cluster, there becoming small and narrow and consisting of a single leaflet. The plant is usually small and upright in habit of growth. The leaflets are rather small and firm, narrow, and coarsely toothed, often nearly smooth, and persisting late in the fall. The fruit is early, roundish, of medium or small size, with large grains. Although first in the race, this type has not been able to maintain the advantage thus secured. No variety of the class can be said to occupy a prominent position in the blackberry fields of to-day.

Americus.—Received at the office of the United States Pomologist in 1894, from J. H. Langille, Kensington, Md., and described in the report for that year. Thought to be a seedling of the Early Harvest. A stout, strong grower, with flowers in rather short, erect, downy spikes. Fruit medium to large, irregular, oval or oblong-conic, jet black, moderately firm, melting, juicy and of good quality, ripening soon after Early Harvest.

Boston High Bush.—Mentioned in the report of the California Horticultural Society of 1886, p. 234. From the connection it is probably Dorchester.

Brunton Early.—An early variety which originated in Illinois. Similar to Early Harvest in habit of growth. It appears to be deficient in pollen production, or self-sterile, and unproductive when planted alone ; not very hardy. Of little value.

Dorchester (Improved High Bush).—A seedling introduced by Eliphalet Thayer, of Dorchester, Mass., who first exhibited it before the Massachusetts Horticultural Society, August 7, 1841. It was largely brought to public notice by Capt. Josiah Lovett, of Beverly, Mass. Capt. Lovett had previously made unsuccessful attempts to transplant the best of the wild bushes to his garden, but after obtaining this variety, turned his best attention to it. Samuel Downer, of Dorchester, Mass., also seems to have been connected with its introduction. This variety is of special interest as being the advance guard of all the blackberries now in cultivation, since it was the first cultivated variety. It is a very upright grower, vigorous, and viciously thorny. Indeed, its strong recurved thorns remind one of the Sand Blackberry, (*Rubus cuneifolius*). Fruit large, oblong, conic, deep, shining black, nearly as large as Lawton; longer, with rather smaller drupelets. It may be an admixture between the argutus and nigrobaceus types.

Early Harvest.—An early variety, found growing wild in Illinois. A moderately vigorous, upright grower, fairly hardy, though often quite tender. Canes greenish, with comparatively few thorns. Fruit small, roundish to oblong, greenish black, soft in texture, juicy, mild and pleasant. Very early, prolific, and valuable where it succeeds, owing to its season.

King (Early King).—Plant rather small, erect, stiff, with several small canes from each stool, making a thick clump; spines large. Berry of medium size, oval, irregular, of best quality; core soft, ripe as soon as black. A week earlier than Snyder, fairly productive, and of medium hardiness. Too soft for market.

See Early.—So much like Brunton's Early that it may be the same.—Ill. Hort. Soc. 1878:125.

IV. The White Blackberries

Rubus nigrobaccus, var. albinus

Although not an important class commercially, many varieties of this type have been introduced. As the name indicates, the chief distinguishing character is the color of the fruit, which is pinkish cream or amber colored. The canes are round, yellowish green, and the leaflets are mostly three, even on the young canes. Otherwise it is like the Long-cluster type.

Adair Claret.—Originated with D. S. Adair, Hawesville, Ky. Plant not quite hardy. Fruit medium size, claret color, soft, with a mild, pleasant flavor.—Downing.

Albion.—A wilding found and introduced by John B. Orange, of Albion, Ill. Described as vigorous and productive. Fruit large, oblong, clear pink, sweet and good. Downing, however, reported it unproductive, of only fair size, imperfect, and without flavor.

Alger.—Originated at Cleveland, Ohio. Of good size, oblong in form. Of a deep claret color ; sweet and rich.

Colonel Wilder.—Introduced by John B. Orange, and named in honor of Marshall P. Wilder. Described as very productive, of a bright cream color, large size, oblong, almost pointed, of superior flavor and quality. Mr. Orange regarded this as the most valuable of his white varieties.—Hov. Mag. 1864:360.

Crystal White (Orange's Crystal).—Originated and introduced by John B. Orange. A vigorous, upright grower, with strong, green spines, lacking in hardiness, and suckering freely. Fruit large, roundish oval, a clear, rich white when fully ripe, sweet, of good flavor, ripening early, but, like the other white varieties, of no value except as a curiosity. It was claimed by the originator to be very productive when grown near other varieties, but to be unproductive when grown alone.

Doctor Warder.—Originated and introduced by John B. Orange. Fruit rather shorter and thicker than the Albion. Nearly as large, color dark ruddy red, quality good.

Kentucky White —Introduced by D. S. Adair, Hawesville, Ky. Plant tender ; fruit medium size, oblong, oval, light dirty white, imperfect.—Downing.

Needham White.—Introduced to notice by J. Shed Needham, of Massachusetts, sometime about 1850. Described as of lilac color, similar to the black varieties in shape, though not quite so large. Of good flavor. Canes light green and thickly covered with short, stiff, green hairs. Though said to be immensely productive, Fuller later speaks of it as unproductive and not worth cultivating. Mentioned in the Transactions of the Ohio Hort. Soc. for 1869, p. 69, as of little value.

Parish Pink.—Another white variety of no more value than the rest.

Texas Hybrid (Texas Pink Hybrid).—Described as vigorous and prolific, earlier than Snyder, of medium size, delicate pink color, sweet and nearly free from seed. Found to be of no value in Ohio.

V. The Loose-cluster Blackberries

Rubus nigrobaccus × *villosus*

These are hybrids between the blackberry and the common dewberry of the eastern states. Their distinguishing feature is to be found in the intermediate character between the two parents. The bushes are low and more or less reclining, the leaflets are broad and jagged, usually three, both on young shoots and bearing canes. The fruit is short and roundish, borne in few- to many-flowered clusters, interspersed with numerous simple broad leaves. The type is common in the wild state where the two species are found growing together.

Eureka.—In 1876 William Parry selected the best and most perfect berries of Wilson's Early, grown by the side of the Dorchester, planted them, grew the seedlings together for four years, then selected the best, which was named Eureka, the others being destroyed.—Mich. Hort. Soc. Rept. 1886: 407.

Mammoth (Thompson's Early Mammoth).—Said to be like the Wilson in size and general habit of growth, a few days earlier, and of rather better quality, large and good. Others pronounce it no improvement over the Wilson.

Maynard.—A variety found growing on the farm of C. C. Maynard, at Kincaid, Kans., between the Lucretia dewberry and the Early Harvest blackberry, and sent out for trial by him as the Maynard dewberry. Berry round, composed of a few very large, jet black drupelets, ripening with the blackberries; many berries in a cluster. Claimed to be large, sweet and productive, succeeding better on poor than on rich soil. At the Nebraska Experiment Station the fruit has so far been too small to be of value.

Newman Thornless.—Discovered by Joseph Newman, Ulster county, New York. Canes of moderate growth, and thornless. Fruit rather large, oval, of very good flavor. According to one grower, it produces few thorns and fewer berries. It is placed in this class on the statement of the Gardener's Monthly, Vol. II, p. 281, that it belongs to the dewberry section. Perhaps it is a true dewberry.

Rathbun.—Sent out by A. F. Rathbun, of Smith's Mills, N. Y. Said to be a good grower, hardy, of large size, fine flavor, juicy, and attractive.

Sterling Thornless.—A chance seedling, found on the farm of John F. Sterling, Benton Harbor, Mich., in a field where Wilson and Lawton had been growing. The canes resemble those of Wilson in size, shape, and color, but are comparatively thornless. The fruit is borne in cymose clusters, with long pedicels, like the dewberries. Size medium to large, round, oblong; possessed of large, rather loosely set, round drupes. Moderately firm, juicy, and sweet, with a trace of dewberry flavor.

Wilson (Wilson's Early).—This variety was discovered by John Wilson, of Burlington, N. J., about 1854. The bush partakes of the habit of both the low and the high blackberry, some of the shoots being erect and branching, like the Lawton, and others without branches, slender, and trailing on the ground like the low blackberry, and indicating a hybrid between that and the high bush species. The trailing shoots sometimes take root at the tips. Wood downy. The fruit is very large, good specimens measuring an inch and a quarter in length by about an inch in breadth, while the largest are an inch and a half long. Firm, somewhat irregular, tapering toward the apex; grains mostly large, but with some small ones mixed in. Flavor quite acid until ripe, when it is rich and sprightly.—Tilton's Journal of Horticulture, 1869: 284. Has been a popular variety in New Jersey. It demands close pruning in order to prevent overbearing, and must be covered for winter protection in most sections.

Wilson Junior.—William Parry, in 1870, selected plants of Dorchester and Wilson and planted them together, far away from any others to mix with, trusting that the pollen of one kind might,

perhaps, mix with the other. In 1875 he selected some of the best Wilson varieties for seed. After watching the other seedlings for four years, the largest and best was selected, and this is Wilson Junior.—Gar. Month. 27: 208. The plant is so like its parent, the Wilson, as to be indistinguishable from it.

VI. The Sand Blackberry

Rubus cuneifolius

This is the species which grows in sandy land in the southern Atlantic states. It is very little known in cultivation, and there is little to induce its introduction, for its formidable thorns brook no unwarranted familiarity. It is a low, stocky plant, with somewhat wedge-shaped leaves, which are more or less downy beneath. The fruit is borne in loose, leafy clusters, being round, loose-grained, very black and of excellent quality.

Topsy (Childs's Tree Blackberry).—Canes stout, upright and viciously thorny, but not hardy; fruit large, late, soft, of good, but not high quality. Of no real value in cultivation.

Recommended Varieties of Blackberries

Few varieties in the preceding lists are of particular interest to the commercial grower. Many have long since passed out of cultivation, while others are yet too new to be depended upon. Among the most important are Agawam, Ancient Briton, Snyder and Taylor, with Early Cluster and Early Harvest for early varieties, though both of these are to be received with caution unless known to succeed in the locality. Other varieties, to be sure, are valuable, especially in certain

regions, as the Dallas in Texas, the Wilson in New Jersey and the Minnewaski in limited areas of New York.

B. THE DEWBERRIES

Like their near relatives, the blackberries, the dewberries are exceedingly variable in character, and many different forms are found, both wild and in cultivation. At least four different species of the genus Rubus are commonly known as dewberries, three of which, together with several botanical varieties, are found in cultivation. Most of the cultivated varieties belong to the common eastern species, *Rubus villosus (Rubus Canadensis* of writers), or some of its botanical varieties, though in the Pacific states varieties of the Coast dewberry, *Rubus vitifolius*, are more common.

The dewberries are distinguished from the blackberries chiefly by their trailing habit of growth, their early ripening, the character of the flower cluster, and the method of propagation. The true dewberries bear but few flowers in each cluster, the clusters are cymose, the center flower opening first, and the flowers are few and scattered, generally borne on long and ascending pedicels, or stems, which tend to raise both flowers and fruit well toward the end of the shoot. In the blackberries the opposite of these characters is found. The clusters are corymbose or racemose, the outer flowers generally opening first, and the flowers are borne in rather dense clusters, the pedicels being shorter, as a rule, and standing more nearly at right angles to the

main stem of the cluster. The dewberries propagate by means of tips, while the blackberries propagate by suckers, a point of much practical importance, in cultivation, at least. Despite these characters, there are forms found, both wild and in cultivation, which are so intermediate in character as to make it a matter of considerable doubt as to whether they should be called blackberries, dewberries or hybrids. These intermediate forms are of special interest, and illustrate in a remarkable way the possibilities of admixture in the genus. Many of them are very productive, in apparent defiance of the pronouncements of science, which are that hybrids should be deficient in fruitfulness.

Of the four species commonly known as dewberries, *Rubus hispidus*, generally known as the running swamp blackberry, although sometimes found on dry, sandy ground also, may first be mentioned. It is a delicate little plant, running on the ground, bearing stiff, shining leaves, which frequently remain green all winter. The flowers are few and small, and the fruit of little or no value. It is simply as a wild form that we need consider it, since there seems to be no reason for attempting to cultivate it.

The most important species, from a horticultural standpoint, is *Rubus villosus* (but universally known as *Rubus Canadensis*), or the Northern dewberry, since it is from this species and its botanical varieties that most of our cultivated sorts have come. This is the species which most nearly approaches the common blackberry in character of plant and fruit. Hybrids between the two are common in regions where both abound.

The specific type of *Rubus villosus* is represented in cultivation by Windom, Geer and Lucretia's Sister. The sub-type known as variety roribaccus is represented by Lucretia; the type designated as *Rubus invisus* by Bartel, General Grant and Never Fail.

Rubus trivialis, or the Southern dewberry, is somewhat similar to *Rubus villosus (R. Canadensis)*, but distinguished from it by having the main canes thickly beset with stout prickles, which are sometimes dark purple in color. The leaves are firm, smooth and practically evergreen, usually bearing stout prickles on the petioles and midribs. It is common throughout the southern states, and often very productive, bearing attractive and desirable fruit. Several varieties belonging to this species have been introduced into cultivation, among which are Manatee, Bauer, and Wilson's White. None of these have become prominent.

Rubus vitifolius, or the Western dewberry, which is the dewberry of the Pacific slope, is a very peculiar species, bearing some slight resemblance to *Rubus villosus (R. Canadensis)*, especially in the young growth. The canes are long and slender, however, and the fruiting branches entirely different, the leaflets being broad, coarsely toothed, light green and pubescent both above and beneath, while the other parts are more or less densely covered with straight bristles and glandular tipped hairs. As explained in the botanical section, this is an exceedingly variable species, and many forms are likely to appear should it become prominent in cultivation. The varieties known as Aughinbaugh, Washington Belle, and Skagit Chief belong here. One

of the obstacles to the successful cultivation of this species is the variable sexual character of its blossoms. If pistillate varieties are introduced, they must of necessity be planted with perfect or staminate plants to insure fruit production. It is doubtful, also, whether even the perfect-flowered sorts would prove fully self-fertile in a species with such a strong tendency to separate sexual development. Until these points are more fully determined, it appears to be a wise precaution, if this species is to be planted at all, to plant more than one variety together.

VII. The Northern Dewberries

*Rubus invisus, R. villosus and Varieties**

Bartel (*Rubus invisus*).—This was the first named variety of dewberry. It was brought to notice sometime in the 70's by Dr. Bartel, of Huey, Clinton county, Ill. The plants are said to have appeared in an old cornfield on his farm, and the large size of the fruit led him to offer them for sale. The fruit is described as large, rich, juicy, slightly acid, but not so sour as the blackberry, and sufficiently solid to bear shipping well.

Colossal.—A sort offered by L. L. May & Co., St. Paul, Minn.

Geer (*Rubus villosus*).—A variety discovered by F. L. Wright, in a wood-lot belonging to a Mrs. Geer, of Plainfield, Livingston Co., Michigan. It was first brought under cultivation in 1887. Said to be productive, though small in fruit.

General Grant (*Rubus invisus*).—Introduced by Charles A. Green, of Rochester, N. Y., in 1885 or 1886. It came from M. W. Broyles, somewhere in Tennessee. It possessed little value, and never became prominent

Latimer Seedling.—Mentioned as on trial at the Geneva (N. Y.) Experiment Station. Received from J. W. Latimer, Pleasanton, Kansas.

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*A full account of the eastern dewberries is given by Bailey in Bulletin 34 of the Cornell University Experimental Station, which is freely drawn upon in making up the following list.

Lucretia (Rubus villosus var. *roribaccus).*—This is the best known of all the dewberries. Found by a soldier in the Civil War, who, being stationed near Beverly, W. Va., during most of his service, returned there after the war in search of a wife, and acquired this dewberry as a perquisite to the plantation owned by her. He transplanted some to his garden, and later sent plants to his father in Ohio. These fell into the hands of B. F. Albaugh, of Covington, Ohio, who named the variety and introduced it to the trade. As sent out, this variety has been greatly mixed, but the true type is a large fruit, productive, of good quality, and gives satisfaction wherever the dewberry succeeds.

Lucretia's Sister (*Rubus villosus.*)—Introduced by J. B. Treedway, of Brandt, Ohio, about 1886. Seems to possess little value.

Mammoth.—Two varieties appear to have been sold under this name, one being *Rubus invisus* and the other *Rubus villosus.* The former Professor Bailey considers to be the same as Bartel. The other he has been unable to trace.—Cornell Univ. Exp. Sta. Bull. 34: 306.

Mayes (Mayes Hybrid, Austin's Improved).—(*Rubus villosus* var. *roribaccus* [?]).—Found growing wild in Texas, on the farm of John Mayes, some time about 1880, mingled with both the native Texan, now called Dallas, and the common dewberry, *Rubus trivialis,* and thought to have been a hybrid between the two. This account of its origin would indicate that it belongs among the southern dewberries, but herbarium specimens seem to agree much more closely with the Lucretia type, and I therefore place it there provisionally. Mr. Mayes began cultivating the variety, and found it to improve under cultivation. Later it was sent out by J. W. Austin, of Pilot Point, Texas, as Austin's Improved. The plant is trailing in habit when young, but is said to become stronger and somewhat upright with age. It propagates by tips or root-cuttings. The fruit is very large, of fine appearance, and the plants are prolific. Young plants at the Nebraska Experiment Station were much more promising than those of Lucretia. Unfortunately these were destroyed by the erection of a building in midsummer, so that their further behavior cannot be reported upon. It seems to be one of the most promising varieties now grown.

Never Fail (*Rubus invisus).*—A variety mentioned by Bailey (l. c.) as known to him only from a specimen and notes received from F. L. Wright, Plainville, Mich., who obtained it from central Indiana, though it is supposed to have originated in central Ohio. Mr. Wright's statement regarding its qualities is that "it never fails to produce an abundance of wood, but always fails to produce fruit. I never had a perfect berry."

Sanford.—A new variety mentioned as on trial at Geneva, N. Y.—Exp. Sta. Bull. 81: 585.

Windom (Cook's Hardy), *(Rubus villosus).*—This variety was first brought to public notice in 1887 by the Seedling Commission of the Minnesota State Horticultural Society. It was discovered and brought into cultivation by Dewain Cook, of that state, who found it to be hardy, productive, of fair size, and good flavor.

VIII. The Southern Dewberries

Rubus trivialis

Bauer.—A variety sent out from Bauer's nursery, Judsonia, Ark. It was said to be a vigorous grower, with fine fruit, but apparently unproductive.

Fairfax.—Bailey refers this variety doubtfully to this group. It was sent out by C. A. Uber, of Fairfax county, Virginia, who found it wild on a stony, unproductive hillside in that county. There the vine was vigorous but not rampant, and the berry large and fine flavored, but when transferred to garden soil it developed excessive growth, with but few and imperfect berries, notwithstanding its proximity to a number of varieties of blackberries, which might have been expected to furnish sufficient pollen.

Manatee.—Introduced by Reasoner Brothers, Oneco, Fla., in 1889. They report it to be only a selected strain of *Rubus trivialis*, but say that it succeeds much better in that state than any other variety, having proved very productive, ripening its fruit in April, and being a good shipper. It is also reported as succeeding in California.

White Dewberry.—White dewberries appear to be well known in Texas. One is mentioned in the Gardener's Monthly for 1877, p. 174, as being known among the horticulturists of that state. What is very likely the same thing was received from Colorado county, of that state, and introduced by Samuel Wilson, of Pennsylvania, in 1890, under the name Mammoth White, or Wilson's White. The natural inference is that the Albino White of Parry and the Crystal White of Childs belong to the same type, and, perhaps, have come from the same source, though I have no proof of this. The variety introduced by Mr. Wilson is said by him to be hardy in Pennsylvania, productive, of large size and excellent quality.

IX. The Western Dewberries

Rubus vitifolius

Aughinbaugh.—This is one of the best known varieties of the Western dewberry, and is especially noteworthy as being the parent of the Loganberry which has attracted so much attention of late. It was propagated and sold by a man named Aughinbaugh, about 1875. The blossoms are pistillate, which means that it should be planted with other varieties to furnish pollen. The fruit is said to be of excellent quality, but the plant is a weak grower and unproductive.

Humboldt.—A writer in The Rural New-Yorker for 1896, p. 574, mentions this as having been selected from the wild blackberry of California, and describes it as a rampant grower and abundant bearer, ripening with Hansell raspberry, a month before the Early Harvest blackberry. Fruit jet black, one and one-half inches long by one inch thick, in selected specimens. Flavor "marvelous, delightfully spicy, with a wild-wood aroma."

Loganberry (*Rubus vitifolius* × *Idæus* [?]).—This berry originated on the grounds of Judge J. H. Logan, of Santa Cruz, California, in 1882, from seed planted by him the preceding year. A full account of its origin, as given by Judge Logan himself, appears in Bulletin 45 of the Rhode Island Experiment Station. It seems that he had for some time been interested in raspberries and blackberries, and had growing together the Texas Early blackberry, the Aughinbaugh dewberry, and an old but unknown variety of red raspberry, resembling the Red Antwerp. In August of 1881 he planted seeds of the Aughinbaugh, expecting to get a cross between it and the Texas Early. He raised about fifty seedlings. One of these, the Loganberry, was very similar in every respect to the parent, but much larger and a stronger grower. At the time the seed was sown Judge Logan did not think it possible to cross the Aughinbaugh with the raspberry, but the characters developed by this seedling have convinced him that it is almost certainly a hybrid between them. One remarkable fact stated by him is that out of thousands of plants grown from seeds of this variety, not one has ever shown, so far as he is aware, any of the distinct characteristics of either parent, not one has gone back to the original type of either the raspberry or the Aughinbaugh, though most of them are inferior to the original plant. He also states that he has never succeeded in crossing the Loganberry with either of its parents, nor with seedling crosses between the Aughinbaugh and the Texas blackberry. Fig. 31 is used, by permission, from Bull. 45 of the R. I. Exp. Sta.

In the characters of the plant, and in the shape and conformation of the fruit the variety is essentially like the Aughinbaugh, propagating entirely by tips, though by artificial methods they may be grown from hard wood cuttings. The core remains with the fruit, like the blackberry, its principal resemblance to the

Fig. 31. The Loganberry.

raspberry being in color and flavor, although the dewberry dominates in flavor. Judge Logan says: "As to the fact of the plant being a hybrid between the blackberry and the raspberry, of course there is no absolute proof. The color, with the distinct raspberry flavor of the fruit, and the circumstances under which it originated, I think render the fact of such a cross almost certain."

The other plants in this lot of seedlings Judge Logan thinks to have been crosses between the Aughinbaugh and the Texas, as he

expected, though they resemble the Aughinbaugh in most of their characteristics. These he also considers valuable, the fruit ripening early, being shining black and very long, some specimens having measured as much as two and one-fourth inches. The Loganberry appears to promise well in the Eastern states. In Rhode Island it passed the winter perfectly when covered, though those left uncovered were killed. The fruit ripened with the raspberry and, while not high flavored, was improved by cooking, and made a desirable sauce. The plant propagates slowly.

Mammoth.—The American Agriculturist, 1897, p. 494, prints a picture of this fruit, natural size, in which individual berries are two and one-fourth inches long and about an inch wide; and it has the following account: "The Mammoth blackberry was originated by Judge J. H. Logan, the originator of the now famous Loganberry, descriptions and illustrations of which have appeared in former numbers of this journal. Judge Logan informs us that the Mammoth is a cross between the wild blackberry of California (*Rubus ursinus*)* and the Texas Early, the former a species of the dewberry type, while the latter has more the shrubby habit of the high blackberry. The most remarkable feature about this new blackberry is that while the fruits of both parents are below medium in size, a cross between the two should produce berries of the largest size, specimens measuring two and three-eighths inches in length being not unusual. When fully ripe, the berries are sweet and of excellent flavor, and for cooking or canning they are unrivaled. Unlike the high blackberry, the Mammoth does not throw up sprouts from its roots, and cannot be propagated from root-cuttings. Instead, its canes run from twenty-five to thirty feet in one season, and strike roots at their ends or tips, like Black-cap raspberries. So far this interesting novelty has not been sufficiently tried outside of its original locality to establish its value for general cultivation, the results of which are eagerly looked for by progressive fruit-growers."

Primus.—A variety produced by Luther Burbank, of Santa Rosa, California, and said by him to be a cross between *Rubus vitifolius* and *R. cratægifolius.* The plant is said to be a strong grower and productive, having in part the trailing habit of the pistillate parent. It is thickly covered with short, blunt prickles, and propagates by tips, though with some difficulty. Fruit large, long, blunt, conical or oval, juicy, subacid, aromatic, resembling the raspberry in flavor, adhering to the core and ripening with the Hansell raspberry. A colored plate, together with a description, appears in the report of the United States Pomologist for 1892.

**R. vitifolius.*

Skagit Chief.—A variety sent out from the state of Washington in 1891.

Washington Belle.—Sent out from the state of Washington with the Skagit Chief. Neither variety appears to have attracted much attention in the Eastern states. As observed by the writer at Cornell, while the plants were still young they appeared to possess the imperfect blossoms characteristic of this species in many cases, which would naturally tend to interfere with their success.

Recommended Varieties of Dewberries

Apparently but three varieties need be mentioned here, the Lucretia for the Eastern states, the Mayes for the West and Southwest, and the Loganberry for the Pacific Coast. How far these will succeed in the other regions it is yet impossible to say. The Bartel is also successfully grown by some persons in Wisconsin and Iowa.

CHAPTER IX

INSECTS AFFECTING THE BRAMBLES

The insects attacking the genus Rubus are many, and to attempt to adequately discuss them all would far exceed the limits of space which can profitably be allotted to the subject. Nevertheless, it seems wise to list, in so far as possible, all which are known to attack plants of the genus in any way, and to give a few of the more important and most easily accessible references to literature on the subject as an aid to those who may have occasion to study any of the species mentioned. To make original observations concerning any considerable number of these species would have been impossible even for an entomologist. In the case of those species considered really injurious, the aim has been to collect and present in condensed and convenient form the more important facts already known about them, together with the methods which at present seem most feasible for combating them. While it is to be hoped that these brief statements will, in most cases, be sufficient to aid the busy man who must meet the insect and meet it at once, the references will doubtless prove far more helpful to any who may wish to make a more careful study of the subject. Original illustrations of the species of greatest economic importance are added. These are drawn

and engraved on wood from the insects themselves, by Anna Botsford Comstock.

THE MORE IMPORTANT INSECTS

The Snowy Tree-Cricket

Œcanthus niveus, Serv.*—Order Orthoptera: Family Gryllidæ

Saunders, Insects Inj. to Fruits. 308.
French, Trans. Ill. Hort. Soc. 1881:199.
Comstock and Slingerland, Bull. Cornell Exp. Sta. 23:124.
Webster, Bull. O. Exp. Sta. 45:206.

The work of this insect is well known, and it has been frequently mentioned, both in entomological and horticultural literature. The insect is a delicate, greenish white cricket, with broad and transparent wing-covers, through which the folded wings can be seen. These wing-covers are crossed by oblique thickenings, or ribs, part of the musical apparatus of the insect. The female appears much narrower than the male, the wing-covers being closely wrapped about the body.

The chirp of this insect is a familiar and prominent nocturnal sound during late summer and early autumn, all the males in the immediate vicinity chirping in unison. The sound may be imagined to bear a faint resemblance to the words *Katy-did, Katy-did*, but is very unlike that of the true Katy-did.

The only injury to plants, worthy of mention, is that caused by the female in depositing her eggs in autumn; these are most frequently placed in berry canes, but are also found in grape vines and on twigs of various trees and bushes. Their location is shown by a long, ragged wound, and if the cane is split open there will be found inserted in the pith, at close intervals, a series of yellowish, oblong, cylindrical eggs, about one-eighth of an inch long.

*For the sake of uniformity with other parts of the volume and of the series of which it forms a part, a comma is inserted after the specific name, and the latter begins with a capital when derived from a proper noun. This practice, though common among European entomologists, is not so general in the United States.

Remedy.—The eggs are laid late in autumn, but do not hatch till the following summer, so that cutting out and burning the wounded portions at the annual pruning is the only remedy necessary. As the young insects are carnivorous, feeding largely on plant lice, the benefit which they render the fruit-grower probably exceeds the injury, unless at times when they are unusually abundant.

The Tarnished Plant-Bug (Fig. 32)

Lygus pratensis, Linn.—Order Hemiptera: Family Capsidæ

Weed, Ins. and Insecticides. 93.
Webster, Bull. O. Exp. Sta. 45:213.
Lygus lineolaris (P. Beauv.).
Forbes, Ill. Rep. 13:115
Saunders, Ins. Inj. Frts. 147.
Capsus oblineatus, Say.
Riley, Amer. Ent. 2:291.

This species is one of the true bugs, a class of insects destitute of jaws, but provided with a sucking beak for drawing the juices from plants. It is very abundant in nearly all parts of the United States, subsisting upon a great variety of plants. Although not regarded as specially injurious in a general way, it sometimes proves very destructive, especially to strawberries, attacking the young fruit, and causing an imperfect development, in the form of "nubbins" or "buttons." It also attacks young blackberries, and perhaps raspberries, in a similar way, in addition to feeding on other tender parts of the plant.

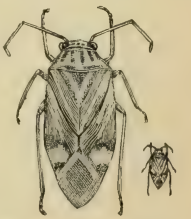

Fig. 32. Tarnished plant-bug. *Lygus pratensis.*

The following brief account is taken from the summary of Forbes's excellent article on this species:

"The old bugs winter under rubbish upon the ground, emerge early in spring, cluster upon the unfolding buds of fruit trees, the fresh foliage of strawberries and other early vegetation, and there lay their eggs, which hatch, and old and young together

drain the sap of these succulent growing parts. The effect is to arrest the development of the leaves, or even to kill them, and in the case of the strawberry, to interfere with the growth of the fruit; sometimes, at least, causing what is known as the "buttoning" of the berry. Later in the season, the buds and leaves of flowering plants and vegetables, especially the cabbage and potato, are attacked.

"There are at least two broods in a year, one maturing in May and June, the other in July and August, while it is possible that there is still another intermediate.

"Although a few of these insects are devoured by birds, no natural enemies are known to have any positive effect upon their numbers. There is some evidence, however, that wet seasons are injurious to them."

Remedies.—Obtaining their food by sucking the juices as they do, the arsenites are of no value in preventing their depredations. Pyrethrum has proved most satisfactory where the expense is not too great. Kerosene emulsion also kills them, and collecting them with insect nets during the cooler parts of the day has sometimes proved practicable.

The Bramble Flea-Louse

Trioza tripunctata, Fitch.—Order Hemiptera: Family Psyllidæ

Psylla tripunctata (Fitch).
Fuller, Amer. Ent. 3:62.
Thomas, Ill. Ent. Rep. 8:18.
Psylla rubi, Walsh and Riley, Amer. Ent. 1:225.
Thomas, Ill. Ent. Rep. 8:17.
Strong, Fruit Cult. 179.

This insect belongs to a family closely related to the Aphides, differing in the veining of the wings, and in having antennæ knobbed at the end. They jump as readily as a flea. The following account of their injury was given by Charles Parry, of Cinnaminson, New Jersey, in 1869:

"The suckers upon which this insect occurs in the spring commence to twirl around, and, when not interfered with, make

a complete revolution before they resume their usual course. The leaves curl up, and become matted around the curl, so as to make a safe harbor for the lice-like larvæ, which during the summer appear on the under surface of the leaves. I presume

Mistletoe of the blackberry.

we can get clear of this insect, after the larvæ are produced by cutting off the curls and burning them."

In 1880 A. S. Fuller calls attention to the rapid increase of this insect, and to the great injury to blackberry plantations caused by it. It is also mentioned by W. C. Strong, in his work on fruit culture, as doing great damage in some localities. The

injury caused by it has been mistaken for a fungous disease at times, and in parts of Delaware it is known as "Mistletoe." (See Fig. 33, from Bull. 117, Cornell Exp. Sta.)

Remedies.—Thorough work in cutting out and destroying the infested tips, taking care that none of the insects escape, would doubtless prove effectual. Mr. Strong recommends strong tobacco water. Kerosene emulsion may prove to be the most efficient and practicable remedy.

The Bud Moth

Tmetocera ocellana, S. V.—Order Lepidoptera: Family Grapholithidæ

Harris, Ins. Inj. Veg. 249 (Flint Ed.).
Saunders, Ins. Inj. Frts. 95.
Fletcher, Ent. Rep. Ont. Dept. Agr. 1885: 24.
Fernald, Bull. Mass. Exp. Sta. 12.
Slingerland, Bull. Cornell Exp. Sta. 50.

This insect has recently proved very destructive to apples, and has also been observed on blackberries. It appears early in spring, as soon as the buds begin to open, eating into them and devouring the inner portions. It is a European species, which first appeared in this country in Massachusetts, about 1841, and has now become widely distributed over the northeastern portion of the United States and parts of Canada.

Some excellent results of observations upon this insect were published by M. V. Slingerland, in Bulletin 50 of the Cornell University Experiment Station, from which many of the following statements are taken.

"The central leaves and flowers are tied together with silken threads, and when the pest needs more food it draws in and fastens an outer leaf or flower. In a short time some of the partly eaten leaves in this nest turn brown and become detached from the branch, thus rendering the work of the pest quite conspicuous."

The larva lives most of the time within a tube formed by roll-

ing the edge of the leaf down, fastening it, and sparsely lining the interior with silk. It comes forth from this tube to feed, but quickly retreats into it again when disturbed. Pupation occurs in a cocoon formed in a similar manner. The moths, which in New York appear in the latter part of June, fly mostly at night, remaining quiet on the trunk and limbs of trees during the day, and are so similar to the bark in color as not to be easily seen.

The eggs are generally laid singly on the under surface of the leaves, and are so nearly transparent that they closely resemble fish scales or minute drops of water. They hatch in from seven to ten days, and these summer larvæ soon make themselves a tube of silk mingled with bits of excrement. They feed on the epidermis and inner tissue of the leaf, not eating through it, and spin a protecting web over their entire feeding ground. After the third moult, when they have attained a length of about 4 millimeters, they leave their tubes, and make for themselves a little silken cell in some crevice or roughness of the bark, where they pass the winter, in readiness for the opening buds the following spring. Their injuries at that time are particularly exasperating, because they apparently destroy as many leaves and flowers as possible by eating only a part of each. There is normally but one brood in northern latitudes, though since the larvæ hibernate when half-grown, two different generations appear during the same season.

Remedies.—The following is Slingerland's summary concerning the treatment of this enemy:

"It is not practicable to try to check this pest in either the adult or egg stages, or while it is in hibernation as a half-grown larva. Undoubtedly it can be checked somewhat by spraying in July, when the larvæ are at work on the under side of the leaves. But the best time to combat the pest the most profitably and successfully is in the spring, when a little poison can be easily sprayed upon the opening buds; and thus the little larva, hungry from its long winter's fast, will be quite certain to get the fatal dose at its first meal."

It is preyed upon by several hymenopterous parasites, a large predacious wasp, *Odynerus Catskillensis*, and by birds.

The Bramble Crown-borer. (Fig. 34)

Bembecia marginata, Harris.—Order Lepidoptera: Family Sesiidæ

Saunders, Ins. Inj. Frts. 303.
Smith, Spec. Bull. N. J. Exp. Sta. N. 9.
Jack, Gar. and For. 1892: 426.
Webster, Bull. Ohio Exp. Sta. 45: 159.
Ægeria rubi, Riley, Mo. Rep. 6: 111.
French, Ill. Rep. 7: 175. Trans. Ill. Hort. Soc. 1881: 193.
Weed, Ins. and Insecticides, 103.

This insect is a near relative of the peach-borer, being so similar in all its transformations that it has at times been mistaken for that insect by growers. The adult insects are clear-winged moths, appearing much like wasps or hornets, for which they may be readily mistaken when seen in the open field. The body of the insect is rather more than half an inch in length, black and prettily banded with golden yellow, with a tuft of yellow hair near the base of the abdomen. The wings are narrow, transparent, with a bronze or reddish brown margin, the front wings having also a narrow cross-band toward the tip. They measure about an inch across when expanded.

Fig. 34 Crown-borer. *Bembecia marginata.*

I quote the following points concerning its life history from John B. Smith:*

"The moths make their first appearance in the fields late in August and early in September, and soon after begin ovipositing. A single egg only is laid on the cane near the surface of the ground, or even a little below. The young larva, when hatched, immediately eats through the bark and begins work at the base of the stalk, where it joins the crown or main root, confining itself largely to the sap-wood. The egg has not been observed by me,

*Special Bulletin N., N. J. Exp. Sta.

nor do I know the duration of this stage. The young larva is yellowish white, usually with a faint reddish tinge. It attains a length of from one-quarter to one-third of an inch during the fall, and has at that time eaten about half through the cane, sometimes entering the pith and boring up into the stem for a short distance. It is likely that this is not an unusual habit, but it is by no means general, and of the many specimens taken, only two were found in the stem early in the season. In very few of the infested canes did I find burrows, old or recent, in the center."

The injury is done by girdling the canes at the base of the main root. In one field in New Jersey, nearly 50 per cent of the canes were infested. As the season advances the larvæ appear to leave the old wood and attack the young shoots, causing them to wilt and die.

Smith observed larvæ of two distinct sizes, and further observation of their transformations led him to the conclusion that the insect remains two years in this state.

Much of the work of this pest has been attributed to winter-killing, from the fact that many of the canes attacked in the latter part of the season remain alive till winter, and fail to leaf out the following spring.

Remedies.—The habits of the species place it beyond the reach of any insecticide, so far as known, and the only practical means of combating it is by removing and burning the infested canes, taking care that no larvæ escape. All dead canes which are visible after growth starts in spring should be examined, and if their death is due to this cause, the borer is pretty sure to be found at the base. Their attacks on the young canes in summer offer an especially favorable opportunity for their destruction, since these tender shoots show the effects of their presence at once, and there is more certainty of discovering the depredator. Thorough work on this plan will almost wholly prevent the development of the perfect insect, and its consequent reproduction and spread. Especially is this true since the larva carries on its work for two years before reaching that state.

The Raspberry Geometer

Synchlora glaucaria, Guen.—Order Lepidoptera: Family Geometridæ

Comstock, Man. of Ins. 288.
Aplodes rubivora, Riley, Mo. Rep. 1: 139.
Synchlora albolineata, Pack.
Eunemoria gracilaria, Pack.
Synchlora rubivoraria, Pack. Mon. Geom. 382.
French, Trans. Ill. Hort. Soc. 1881: 196.
Saunders, Ins. Inj. Frts. 316.

This small caterpillar feeds on the leaves and fruit of the raspberry and blackberry, especially the fruit, and is more conspicuous for its unwelcome presence there than for the amount of injury which it does. It is particularly troublesome because it has the ability to so thoroughly disguise itself that it is difficult to detect. It does this by fastening to the thorny prickles on its body bits of dried berry, seed, pollen, leaves and other debris which, added to its habit of looping itself into a small ball, renders the disguise complete.

Confining itself principally to the ripe fruit, no practical remedy seems to be available.

The Raspberry-cane Maggot

Phorbia sp.—Order Diptera: Family Anthomyidæ

Slingerland, Bull. Cornell Univ. Exp. Sta. 126: 54.

This is the larva of a true fly, grayish black in color, closely resembling the common house-fly, though not quite as large. The larva is a slender, white, footless maggot, found burrowing in the tips of raspberry canes. It is closely related to the radish and onion maggot. The eggs are laid early in spring, very soon after the young canes start, in the fork at the base of the tip leaves. The young larva burrows into the cane near the point of hatching, works its way downward in the pith a short distance,

then proceeds to girdle the cane inside the bark. The part above the girdle soon wilts, turns to a dark blue color and dies. The effect is usually to kill the entire shoot also. The larva continues to bore downward in the dead or dying cane, transforms to a pupa near the base, and there remains until the following spring, when it emerges as the adult fly.

Although often a serious pest, the insect may readily be overcome. If the wilting tips are gathered and burned as soon as noticed, which will usually be during May, the work of those larvæ will be forever ended. Professor Slingerland also found* that many of the pupæ were destroyed by a hymenopterous parasite, *Idiasta incompleta*.

The Pale Brown Byturus (Fig. 35)

Byturus unicolor, Say.—Order Coleoptera Family Dermestidæ

Saunders, Ins. Inj. Frts. 310.
French, Trans. Ill. Hort. Soc. 1881: 198.
Fitch, N. Y. Rep. 14: 358.
Jayne, Proc. Amer. Philosoph. Soc. 1882: 345.

This insect is a doubly troublesome one, on account of the injury and annoyance which it causes both in the perfect and in the larval state. The mature insect is a small beetle about three-twentieths of an inch long, of a yellowish brown or pale reddish color, and densely covered with fine, pale yellow hairs. In this form it is injurious to raspberries and blackberries by eating into the flower buds and destroying the sexual organs. A hole in the side of the bud will show where the beetle has entered. When the injury is complete, the buds usually wither and fail to open; if only partial, the flower may expand, but only to develop an imperfect, worthless berry. It also attacks the open flowers, partially hiding at the base of the stamens. It

Fig. 35. *Byturus unicolor.*

* Local citation.

works chiefly in the morning and evening, seldom being seen in the middle of the day.

Its offspring next makes its presence unpleasantly noticeable as a small, soft, tarnished white worm, remaining on the fruit of the red raspberry when it is gathered. It is usually found within the cup or cavity of the berry, and is difficult to detect. This can only be done by carefully examining the berries one by one, though even then many of the smaller worms are likely to evade the keenest search.

When full grown, the larva drops to the ground, often with the berry, no doubt, hides under any convenient rubbish, forms a little cell in the earth, and changes to a hairy pupa of a pale, dull yellowish color. Here it remains during the winter, transforming to the perfect beetle about the middle or latter part of May, and emerging in time to carry on its destructive work in the blossom buds.

Remedies.—Spraying with Paris green, not too strong, using as much lime as Paris green, just as the buds are developing, will probably check its ravages to a great extent.

The Red-necked Cane-borer (Figs. 36, 37)

Red-necked Agrilus.—Gouty-gall Beetle

Agrilus ruficolis, Fabr.—Order Coleoptera: Family Buprestidæ

Walsh and Riley, Amer. Ent. 2: 103, 128.
Saunders, Rep. Ent. Soc. Ont. 1873: 8. Ins. Inj. Frts. 307.
Lintner, N. Y. Rep. 6: 123.
Smith, Spec. Bull. N. J. Exp. Sta. N: 4.
Horn, Trans. Amer. Ent. Soc. 18: 289.
Hopkins, Bull. W. Va. Exp. Sta. 15. Ann. Rep. 3: 160.
Webster, Bull. Ohio Exp. Sta. 45: 191.

In winter and spring the canes of raspberries and blackberries often show one or more comparatively small and regular swellings, an inch or more in length, the outer portions being roughened with brownish slits and ridges. They are rarely more than one-third thicker than the normal cane, and are caused by the work of a

small borer, which is very similar in appearance and which belongs to the same family as the flat-headed apple-tree borer. This swelling, which is a pithy gall, has been named by Dr. Riley the Raspberry Gouty-gall —*Rubi podagra*—although there seems to be no good reason for applying a special name to the gall so long as the insect which produces it is equally well known. The galls are usually confined to the main canes, and may be near the base, or two or three feet above ground, though sometimes even the more vigorous laterals are attacked. The injured canes may put forth leaves and blossoms, but the fruit seldom ripens, and the cane dies before the end of the season.

The larvæ burrow in a spiral direction, confining themselves, in the early stages of their existence, wholly to the sap wood, and by this means girdle and kill the cane. According to one observer, this habit of girdling the cane in order to kill it the first season seems to contribute to the safety of the larvæ, which otherwise freeze and perish, perhaps owing to the greater quantity of sap which surrounds them in living canes. They are said to be more frequently destroyed in this manner in blackberries than in raspberries. Like the crown-borer, it often escapes detection by reason of the belief that the injury is due to winter-killing.

Fig. 36. *Agrilus ruficolis.*

Fig. 37. Work of red-necked Cane-borer.

The larva reaches its full size toward the latter part of April, bores into the middle of the cane, where it will be more secure from insect foes, forms a smooth, oval cell, and transforms into a white pupa, showing quite plainly the marks of the future beetle. It gradually darkens, and assumes more and more the form of the perfect insect. The mature beetles begin to emerge about the last of May, and are usually most abundant in June. It is during this period that the eggs are laid.

John B. Smith, who has examined large numbers of the very young larvæ, finds that the egg is laid at the base of a leaf-stalk, generally near the ground. He says: "The beetle probably does not lay more than one egg at the same point, and one larva at a leaf-stalk is the rule; but sometimes different specimens may choose the same point for oviposition, and in one case three larvæ had started together, burrowing under the bark, each for himself, in distinct channels. There seems to be no rule as to the direction in which the girdling is done, some starting to the right and some to the left. Sometimes, when eggs are laid at the base of a leaf from which a vigorous lateral starts, the young larva will run up the lateral rather than the main stem. Early laterals are sometimes as badly infested as the main shoots."

The insect is thought to prefer raspberries to blackberries, as a rule, but in New Jersey the Wilson blackberry suffers most of all. Professor Smith observes that although it attacks black raspberries, there are no galls formed and no injury is done, the larva apparently confining its work to the center of the cane.

Remedies.—A knowledge of the life history of the insect at once reveals the remedy. As the perfect insect does not emerge from the cane till late in spring, it is only necessary to attend to the spring pruning promptly, taking especial care to watch for and remove all galls. This may often necessitate cutting away whole canes, but the value of the treatment depends entirely on the thoroughness with which it is done. All wood cut away should be carefully collected and burned, for removing it from the root in no way hinders the development of the beetles. It is important that growers coöperate and do the work thoroughly, for one neglected patch will serve as a breeding ground for a whole neighborhood.

If its habit of work on the black-cap, which prevents the formation of galls, is general, this may form a barrier to its destruction because more difficult to detect. It has usually proved more destructive in the southern than in the northern states.

The Rose Chafer (Fig. 38)

Macrodactylus subspinosus (Fabr.)—Order Coleoptera: Family Scarabæidæ

Harris, Ins. Inj. Veg. 35 (Flint Ed.).
Saunders, Ins. Inj. Frts. 280.
Riley, Ins. Life, 2: 295.
Smith, Ins. Life, 3: 220.
Horn, Trans. Amer. Ent. Soc. 1876: 183.

This insect is one of the most dreaded enemies of the horticulturist wherever it occurs. It seems to be created on a plan which renders it proof alike against arsenites, pyrethrum, and all known insecticides. It can be scalded to death, but this is not a practical treatment on a large scale.

Their favorite breeding places appear to be open fields of light, sandy soil. In New Jersey, where they are particularly destructive, Professor Smith states that they breed in the whole of the sand district of South Jersey, the larvæ being abundant everywhere in the brush lands, even down to the shore. In July the female beetle lays about thirty whitish, nearly globular eggs about one-thirtieth of an inch in diameter, which are placed one or two inches beneath the surface of the ground. The eggs hatch in about twenty days, and the young larvæ feed on the roots of grasses and other plants until the approach of cold weather, when they work their way deeper into the ground, passing the winter in a torpid state. In spring they approach the surface and form an oval cell of earth in which to pupate, and from which they emerge in great numbers, all at once, a habit common to other beetles of the class to which they belong. This occurs about the time

Fig. 38. Rose-bug.

that grapes are in blossom. The favorite food of the mature beetle consists of flowers, especially those of the rose, grape, spiræa, sumach, magnolia, etc.; but the foliage of nearly all plants also suffers. In one report of their ravages in New Jersey, Professor Smith says: "Of the small fruits, the blackberries seemed very attractive. They were on each blossom, and ate the petals but left the green forming fruit. Last year they ate the leaves as well, and left only the canes. This year they left the leaves. Raspberries were totally destroyed."

Although occurring throughout the greater portion of the northern half of the United States east of the Rocky Mountains, it appears to be more or less local in its habits, for in parts of central New York and northern Pennsylvania it is seldom or never seen. In the Gulf states the species is replaced by the closely allied one, *M. angustatus*, and in the extreme southwest by *M. uniformis*. These are very similar in appearance, differing only in the character of the prosternal process and the pubescence, but have not thus far proved so injurious.

Remedies.—When occurring in such vast numbers as they frequently do in some sections, nothing avails against them, and the cultivator is utterly helpless before their march. Where their numbers are limited, kerosene emulsion, pyrethrum, and coating the vines with whitewash to which crude carbolic acid has been added, have been found useful, and sometimes really satisfactory. Mechanical devices for knocking them off and catching them have, in some cases, proved more practicable than any other plan. At one time it was thought that hot water would prove effective against this insect, but notwithstanding the apparent simplicity of such a remedy it was found to be impracticable for general use. The temperature required is about 130 degrees Fahrenheit, but the range is very narrow. If much above this temperature the plants are injured, if much below it the insects suffer no harm. To maintain the right degree of heat in field operations is not feasible. Even if the water as it leaves the nozzle has the right temperature, it may not have when it touches the insect.

The Giant Root-borer (Fig. 39)

Prionus laticollis (Dru.).—Order Coleoptera: Family Cerambycidæ

Riley, Mo. Rep. 1: 124.—2: 87.
Saunders, Ins. Inj. Frts. 227.
Thomas, Ill. Ent. Rep. 6: 147.
Smith, Spec. Bull. N., N. J. Exp. Sta.

The following statements concerning this species are quoted from Professor John B. Smith's bulletin on blackberry insects:

"Besides the crown-borer, the blackberry also harbors in its roots an enormous beetle larva between two and three inches in length, white in color, with strongly marked constrictions at the segments, a distinct enlargement anteriorly, and a small, smooth, brown head, with stout, dark-brown jaws. The parent of this larva is a long-horned beetle, and most probably *Prionus laticollis*, Dru. Dr. Riley found this larva injuring roots of grape and apple in Missouri more than twenty years ago, and it has been found also in other trees. So far as I am aware, it has not been heretofore recorded as a blackberry pest. Dr. Riley, from observations made by him, concluded that the larva required three years to come to maturity, and with this conclusion my own observations agree.

Fig. 39. Root-borer.—*Prionus laticollis.*

"The pupa is formed in June or early in July, and the beetle makes its appearance at about the middle of the latter month. It is rarely seen, even where not uncommon, and flies principally at night. Fortunately this borer is comparatively scarce; but where it does occur, signs of its work are readily observable. It lives in the large, woody portion of the main root, in which it bores huge channels, and the sudden dying off of several canes in a hill is a

certain indication of its presence. Rarely only a single cane will be affected, and then if a crown-borer is not found, the presence of this insect in the main root is almost certain."

Remedies.—"Whenever signs of its presence are noted, it should be at once sought for and destroyed. It is more common in old, carelessly kept fields, and, where numerous in such places, it will be better to grub out and burn all suspected stocks, and replace them by new plants. This should be done before the middle of June, to prevent the maturing of the beetles."

The Raspberry-cane Borer (Fig. 40)

Oberea bimaculata (Oliv.)—Order Coleoptera : Family Cerambycidæ

Saunders, Ins. Inj. Frts. 305.
Lintner, N. Y. Rep. 5: 231.
Comstock and Slingerland, Bull. Cornell Exp. Sta. 23: 122.
Saperda tripunctata, Fabr.
Harris Ins. Inj. Veg. 114 (Flint Ed.).
Oberea tripunctata (Fabr.).
Bethune, Canad. Ent. 9: 226.
Saunders, Rep. Ent. Soc. Ont. 1873: 9.
Oberea perspicillata, Hald.
Riley, Mo. Rep. 6: 111.

Fig. 40. Cane-borer. *Oberea bimaculata.*

The larva of this species is a footless grub, similar to the round-headed apple-tree borer in form, found boring in both blackberry and raspberry canes. It is best known as a raspberry insect, but in Bulletin 23 of the Cornell University Experiment Station, from which the following quotations are taken, an instance is recorded of serious injury to blackberries. In this case the boring larvæ were found only in the bearing canes, while in raspberries they attack the young shoots.

"The mature insect is a long-horned, slender-bodied beetle about half an inch in length. It is of a deep black color, except the segment next the head, the prothorax, which is yellow. There are usually two or three black spots on the upper part of this segment, but frequently these are wanting.

"The eggs are laid in the early summer, usually during the month of June. They were not observed in the blackberry; but when the insect infests raspberries, the first indication of the injury noticed is usually the withering and drooping of the ends of the young shoots. If these be examined, there will be found at the base of the wilted portion two rows of punctures encircling the cane about half an inch apart, and between them a small hole in which an egg has been deposited. This double girdling of the cane is done by the beetle with her jaws at the time she lays her egg. It has been suggested that the purpose served by this girdling is the arresting of the circulation of the sap in this part of the cane; and in this way the prevention of the crushing of the tender egg by a vigorous and rapid growth of the tip of the cane." The larvæ bore downward in the pith of the cane, probably reaching the root in autumn, where they transform and pass the winter. "The burrows are about one-eighth of an inch in diameter; they wind from side to side of the pith, and at frequent intervals penetrate the woody part of the cane. In some of the cases where the woody part of the cane is penetrated, an opening is made through the bark. These openings occur at intervals of a few inches throughout the length of the tunneled portion of the canes; they are small, being about one-third of the diameter of the burrow; and their object is to enable the larva to deposit its excrement outside of the burrow."

Remedies.—"The methods of combating this insect are simple, but they require prompt attention. As soon as the tips of the canes begin to droop they should be cut off below the point where they are girdled. In this way the larva can be destroyed before it has begun to bore into the lower portion of the cane, and thus only the tip of the cane will be lost. When, however, the first indication of the presence of this pest is the dying of the entire cane, caused by the boring of the larva, the infested canes should be promptly cut out and burned. These canes can be readily recognized by the dying of the leaves and by the small holes in them described above. They are most likely to be observed at the time of the blackberry harvest. It is of the utmost importance that the cutting and burning of these canes should be done

promptly. For if it be delayed till autumn, the larvæ will have penetrated the roots and will then be beyond the reach of the pruning shears."

The Strawberry Weevil (Fig. 41)

Anthonomus signatus, Say.—Order Coleoptera: Family Curculionidæ

Chittenden, Ins. Life, 5: 167.
Hamilton, Can. Ent. 24: 41.
Anthonomus musculus, Say.
Riley, Rep. U. S. Dept. Agr. 1885: 276.
Fletcher, Rep. Can. Exp. Farms, 1890: 173.
Beckwith, Bull. Del. Exp. Sta. 18.

This insect, which was first noticed as injurious to the strawberry in 1871, is at the present time coming to be a most serious pest, not only to strawberries, but to blackberries as well. It is a small curculio, or snout-beetle, about one-tenth of an inch long, with black head and convex shining wing-covers variable in color. Its injury to strawberries has been so great that a series of special investigations were carried on during the season of 1892 by F. H. Chittenden, of the U. S. Department of Agriculture, the results of which appear in Insect Life, Vol. V, p. 167, which is freely quoted here. The principal damage is done by the adult beetles puncturing the pedicel or flower-stem a short distance below the flower-buds. Concerning its work on blackberries, Mr. Chittenden says: "A blackberry patch at Falls Church, of the variety known as Early Harvest, was visited June 3, and although the bushes were covered with white blossoms, betokening, under normal conditions, a rich crop of berries, it was soon seen that the insect had been at work, but not in the same uniform manner as on the strawberry, some plants being noticeably more injured than others. An estimate of the total damage done to the patch is about 20 per cent. Badly damaged sprays selected at random showed an average of

Fig. 41. Weevil. *Anthonomus signatus.*

five or six injured buds to each flower cluster. On one large spray over two-thirds had been killed."

It was found that the work of the insect on the blackberry did not differ materially, either in appearance or ultimate injury, from that on the strawberry. In the strawberry, however, the punctures were nearly always plainly seen, both on the bud and the stem beneath, while in the blackberry only a small proportion of the blighted buds showed the punctures plainly. Sometimes the wounded spot in the calyx had healed up or grown over, so as to be nearly invisible, and in other cases the punctures had been made between the sepals.

"Raspberries of the black-cap varieties appear to be exempt from the attack of the strawberry weevil, but whether or not the red raspberry enjoys the same immunity has not been ascertained. On Mr. Sprangle's place, at Falls Church, a patch of black-caps, which is located between the infested strawberry bed and blackberry bushes previously referred to, was repeatedly examined for traces of the attack of this insect, but most careful search failed to show any signs of injury, and no beetles were found, even with the aid of a beating net.

The wild plant, *Rubus villosus* (that is, *R. nigrobaccus*) is probably the natural food-plant of this species. Dewberries, *Rubus Canadensis* (that is, *R. villosus*) were examined and a number of injured buds were found, but on close inspection proved to contain only Dipterous larvæ. It is still somewhat doubtful whether this species is attacked or not, but it certainly is not to any great extent."

The following is Chittenden's summary of the life-history of the species: "The insect undergoes true hibernation, i. e., in the adult state, and in April individuals of this hibernating brood begin to crawl forth from their winter quarters, fly to the nearest flowers, and commence feeding. They probably continue to issue from their hiding-places for a month after the first arrivals make their appearance.

"Blackberries are invaded at the time that the plants begin blooming, or about four or five weeks later than the strawberry. Wild blackberry is visited still later, and the beetles continue on

this plant for some time. The injury to these plants is done by the female in the course of oviposition, and is produced by puncturing the stems just beneath the buds, causing the death of the plant above the point of attack. A single egg is deposited at this time in each flower-bud. The larvæ are believed to hatch within from three to five or six days after the egg is deposited in the bud, and probably attain their full growth three or four weeks thereafter, when they transform to pupæ. The pupal stage lasts from about five to eight days, according to thermometric conditions, and the first mature insects of the new brood begin to issue from the strawberry buds toward the end of May, continuing through the month of June, and in exceptional cases into July. The beetles are so seldom seen after the middle of July that they are believed to begin to hibernate at this time. Our observations indicate only a single annual generation. All of the earlier stages of the insect are passed in the bud. It never attacks the fruit.

The larva, which in general appearance resembles the grubs or "worms" found in plums, cherries and nuts, feeds at first on pollen and the stamens and pistils of the unopened flower, but if these are consumed before it completes its growth, the receptacle is attacked. Pollen is thought to furnish the greater portion of the food of the adults also, a fact which accounts for the greater injury to staminate varieties of strawberries, and especially those which are the most prolific pollen bearers.

Remedies.—Four species of parasites have been bred from the insect, and these will doubtless aid in checking their multiplication to a certain extent. Few practical remedies seem thus far to have been tried, and the most that is offered is in the line of suggestions. Kerosene emulsion and pyrethrum, applied when the beetles are at work, may be found satisfactory. The planting of very early staminate varieties as a decoy or trap crop for the hibernating brood, and wild bergamot or horse-mint for the new brood, is suggested. The beetles are said to fairly swarm on this plant when in bloom, and can be readily captured with a sweeping net or reached with insecticides.

Mr. Chittenden's investigations show the insect to be averse to working or feeding in shady places, and he suggests a protecting

screen of muslin, netting or paper, as affording certain immunity from attack on small patches where available.

The Raspberry Saw-fly

Monophadnus rubi (Harris.)—Order Hymenoptera: Family Tenthredinidæ

Selandria rubi, Harris.
Saunders, Ins. Inj. Frts. 311.
Thomas, Ill. Rep. 6: 61. 10: 67.
Webster, Bull. Ohio Exp. Sta. 45: 154.
Norton, Trans. Amer. Ent. Soc. 1: 249.

This is a four-winged fly which appears soon after the raspberry leaves unfold. It is thus described by Professor Saunders:

"The wings, which are transparent, with a shining surface and metallic hue, measure, when expanded, about half an inch across: the veins are black, and there is also a streak of black along the front margin extending more than half way towards the tip of the wing. The anterior part of the body is black, the abdomen dark reddish. In common with some other species of Selandria, these flies have a habit of falling to the ground when disturbed, especially in the cool of the morning, and remaining inactive long enough to enable one to catch them; but with the increasing heat of the day they are much more lively, and take wing readily when approached.

"The eggs are buried beneath the skin of the leaf, close alongside of the ribs and veins, placed there by means of the saw-like apparatus with which the female is provided, where it swells somewhat and produces a slight discoloration of the cuticle on the upper surface. The skin covering the surface of the swelling is so thin and semi-transparent that the movements of the larva may be observed a day or two before hatching, by the black spots on the side of the head showing through. The larva escapes through an irregular hole made on one side of the swelling.

"The young larva is about one-twelfth of an inch long, with a large greenish white head, having a black eye-like spot on each

side; the body nearly white, semi-transparent, and thickly covered with transverse rows of white spines." As its age increases it assumes a close resemblance to the color of the leaf on which it feeds. When full grown it leaves the bush, enters the ground and constructs a little oval earthy cocoon mixed with silky and glutinous matter, from which the fly emerges the following spring.

Remedies.—Spraying or dusting with hellebore proves an efficient remedy.

THE LESS PROMINENT INSECTS

While the preceding list aims to include all species which are sufficiently injurious to possess real economic importance, it is obvious that no strict dividing line can be drawn. In some cases insects included in the following list have done much more injury than many of those already mentioned. Much depends upon local conditions and environment. If special conditions favor an unusual development of any particular species, the food supply of its parasites is thus increased, thereby inducing an increase of the parasites, and enabling them to reduce the species to normal conditions. Thus nature's balance-wheel prevents the undue increase of any class of her children and consequent destruction by them.

To all having access to entomological literature, the references given here will be of aid in quickly obtaining information upon any of these species which may chance to manifest unusual development and consequent injury. Many of those mentioned can never prove injurious, and to know this fact may at times be even more welcome than to find methods of combating them as foes.

CLASS ARACHNIDA (Spiders and their relatives)

Order Acarina

Tetranychus telarius (Linn.). The Red Spider.—Attacks raspberries under glass, doubtless also in the field in dry climates, as it does many other plants.

Bryobia pratensis, Garman. The Clover Mite. Riley and Marlatt, Ins. Life 3:45. Rural New-Yorker 1894: 568. On raspberries.

CLASS MYRIAPODA (Centipedes and Millipedes)

Order Chilognatha

Iulus impressus, Say. Webster, Bull. O. Exp. Sta. 45:216.—Ins. Life 2:258. Found in raspberry fruit after being harvested.

CLASS HEXAPODA (Insects)

Order Orthoptera

FAMILY ACRIDIDÆ.

Melanoplus spretus (Thomas). Comstock, Man. Ins. 110. [*Caloptenus spretus*, Thomas. Riley, Mo. Rep. 7:159.] Nearly omnivorous; injures blackberries more than raspberries.

FAMILY LOCUSTIDÆ.

Orchelimum glaberrimum, Burm. Riley, Mo. Rep. 5:123.—Fruit Recorder, 15:180 (1883). Webster, Bull. O. Exp. Sta. 45:205. Deposits its eggs in the canes and other pithy stems.

Order Physopoda

Thrips tritici. Fitch, N. Y. Rep. 2:304. Lintner, Rep. N. Y. Agr. Soc. 1881–82:192, Webster, Bull. O. Exp. Sta. 45:207. On flowers of raspberry and blackberry.

Order Hemiptera

FAMILY LYGÆIDÆ.

Nysius angustatus, Uhler. Lintner, N. Y. Rep. 5: 321. Riley, Rep. U. S. Dept. Agr. 1884: 315. [*Nysius destructor*, Riley. *Nysius raphanus*, Howard.] On raspberry fruit; a general feeder.

FAMILY PENTATOMIDÆ.

Cosmopepla carnifex (Fabr.). Lintner, N. Y. Rep. 2: 144. Webster, Bull. O. Exp. Sta. 45: 212. [*Cimex carnifex*, Fabr.] On leaves and stems of blackberry and potato, fruit of currant, etc.

Euschistus variolarius, Pal. Beauv. Townsend, Ins. Life, 2: 44. Reported as injuring red raspberry fruit.

FAMILY CORIMELÆNIDÆ.

Corimelæna pulicaria, Germar. (Fig. 42.) Bethune, Canada Farmer, Aug. 1, 1870. Riley, Mo. Rep. 2:33. Saunders, Ins. Inj. Frts. 317. French, Trans. Ill. Hort. Soc. 1881:200. [*Thyreocoris pulicarius* (Germar.). Forbes, Ill. Rep. 13:106.] Piercing raspberry fruit and injuring it by the "bed-bug aroma" imparted by its presence.

Fig. 42. *Corimelæna pulicaria.*

FAMILY CICADIDÆ.

Cicada septendecim, Linn. Packard, For. Ins. 95. Riley, Rep. U. S. Dept. Agr. 1885: 223.—Bull. U. S. Div. Ent. 8. Comstock, Man. Ins. 150. Eggs deposited in berry canes, twigs of trees, etc.

FAMILY CERCOPIDÆ.

Aphrophora quadrangularis, Say. Walsh and Riley, Amer. Ent. 1:228. Lintner, N. Y. Rep. 5:245. Morse, First Book Zoöl. 97. (1875 ed.) A spittle insect; a general feeder, often found on blackberry.

FAMILY JASSIDÆ.

Typhlocyba tricincta (Fitch). Forbes, Ill. Rep. 14:115. [*Erythroneura tricincta*, Fitch, N. Y. Rep. 3:392.] On raspberry, currant and grape leaves.

FAMILY APHIDIDÆ.

Aphis rubicola. Oestland, Geog. and Nat. Hist. Surv. Minn. Bull. 4:60. On leaves of red raspberry.

Macrosiphum rubicolum. Oestland, Rep. Geog. and Nat. Hist. Surv. Minn. 14:27.—Bull. 4:78. On twigs and leaves of red raspberry.

Pemphigus rubi. Thomas, Ill. Rep. 8:147. French, Trans. Ill. Hort. Soc. 1881:200. On leaves of black raspberry.

Sipha rubifolii. Thomas, Ill. Rep. 8:121. On blackberry leaves.

Siphonophora rubi, Kalt. Thomas, Ill. Rep. 8:64. French, Trans. Ill. Hort. Soc. 1881:200. On raspberry and blackberry.

FAMILY ALEYRODIDÆ.

Aleyrodes sp.? Observed on leaves of *Rubus odoratus* at Ithaca, N. Y., in the summer of 1893.

FAMILY COCCIDÆ.

Lecanium Fitchii, Signoret, Essai, 404. Comstock, Rep. Cornell Univ. Exp. Sta. 2: 133. On raspberry and blackberry.

Mytilaspis pomorum (Bouché.). Comstock, Rep. U. S. Dept. Agr. 1880:325.—Rep. Cornell Univ. Exp. Sta. 2:118. Saunders, Ins. Inj. Frts.: 40. [*Aspidiotus pomorum*, Bouché.] On raspberry in common with other plants.

Aulacaspis rosæ (Bouché.). [*Diaspis rosæ* (Sandberg). Comstock, Rep. U. S. Dept. Agr. 1880:312.] On rose, raspberry and blackberry.

Chionaspis furfurus (Fitch.). Saunders, Ins. Inj. Frts.: 44. Comstock, Rep. U. S. Dep. Agr. 1880: 315.—Rep. Cornell Univ. Exp. Sta. 2:103. [*Aspidiotus furfurus*, Fitch, N. Y. Rep. 3: 352. *Aspidiotus cerasi*, Fitch, N. Y. Rep. 3: 368. *Diaspis Harrisii*, Walsh. Riley, Amer. Nat. 15: 487.] On black raspberry, apple, pear and other trees.

Order Lepidoptera

FAMILY MEGALOPYGIDÆ.

Megalopyge crispata (Pack.). Comstock, Man. Ins. 218. [*Lagoa crispata*. Packard, Amer. Nat. 19:714.—For Ins: 139. Lintner, Ent. Corres. 2:138.—Rep. N. Y. Cab. Nat. Hist. 4:138.] On leaves of blackberry, raspberry plum, apple, and other trees.

FAMILY EUCLEIDÆ.

Empretia stimulea, Clemens. Saunders, Ins. Inj. Frts. 113—353. Packard, For. Ins. 146. Webster, Bull. O. Exp. Sta. 45: 168. A general feeder.

FAMILY PTEROPHORIDÆ.

Oxiptilus tenuidactilus, Fitch. [*Oxiptilus nigrociliatus*, Zell. Saunders, Ins. Inj. Frts. 314. *Oxiptilus delavaricus*, Zell. Forbes, Ill. Rep. 14: 91.] On leaves of raspberry and blackberry.

FAMILY GRAPHOLITHIDÆ.

Eudemis botrana (Schiff.). Saunders, Ins. Inj. Frts. 299. [*Penthina vitivorana*, Pack. Riley, Mo. Rep. 1: 113. Walsh and Riley, Amer. Ent. 1:177.] On blackberry blossoms, and within the fruit of grape.

Exartema permundana, Clem. (Fig. 43.) Clemens, Proc. Phila. Acad. Sci. 1860: 356. Comstock, Rep. U. S. Dept. Agr. 1880: 267. [*Eccopsis permundana* (Clem.). Packard, For. Ins. 312.—Rep. U. S. Dept. Agr. 1885: 330. Saunders, Ins. Inj. Frts. 324.] On leaves of raspberry, blackberry, strawberry, and other plants.

Fig. 43. *Exartema permundana.*

Phoxopteris comptana, Fröl. Saunders, Ins. Inj. Frts. 323. Forbes, Ill. Rep. 13: 87. [*Anchyloptera fragariæ*, Walsh & Riley, Amer. Ent. 1:89. Riley, Mo. Rep. 1:142.] On leaves of strawberry, raspberry and blackberry.

FAMILY TORTRICIDÆ.

Cacœcia rosaceana (Harris). Packard, For. Ins. 505. Saunders, Ins. Inj. Frts. 90. [*Laxotenia rosaceana*, Harris, Ins. Inj. Veg. 48 (Flint ed.). Thomas, Ill. Rep. 11: 10.] On leaves of rose, apple, raspberry, blackberry, etc.

Cacœcia rosana, Linn. Comstock and Slingerland, Bull. Cornell Exp. Sta. 23:119. Webster, Bull. O. Exp. Sta. 45:180. Comstock, Man. Ins. 244. A general feeder.

Lophoderus velutinana, Walk. Forbes, Ill. Rep. 14: 88. Packard, For. Ins. 196. On blackberry, oak, balsam-fir and maple.

Loxotænia musculana, Hub. Fernald, Trans. Amer. Ent. Soc. 10:13. On Rubus, and many other plants.

FAMILY NEPTICULIDÆ.

Nepticula rubifoliella, Clemens, Tineina N. Amer. (Stainton), 152. — Proc. Phila. Acad. Sci. June, 1860. Mining in leaves of blackberry.

Nepticula villosella, Clemens, Tineina N. Amer. (Stainton), 164–174. —Proc. Ent. Soc. Phila. 1: 84. Mining in blackberry leaves.

FAMILY LITHOCOLLETIDÆ.

Tischeria ænea, F. & B. Chambers, Bull. U. S. Geol. and Geog. Surv. 4: 99–113. [*Tischeria malifoliella*, Clemens, Proc. Phila. Acad. Sci. 12: 208. Tineina N. Amer. (Stainton), 141. Weed, Ill. Rep. 15: 45.] Mining in leaves of Rubus. Now considered distinct from the apple-leaf miner.

FAMILY SESIIDÆ.

Sesia hemizoniæ (Hy. Edw.). [*Ægeria hemizoniæ*, Hy. Edwards, Papilio, 1: 198. Rivers, Papilio, 3: 26.] Boring in the pith of cultivated raspberries.

FAMILY NOTODONTIDÆ.

Apatelodes torrefacta (Sm. & Abb.). Hy. Edwards, Bull. U. S. Nat. Mus. 35: 67. A rare southern moth, known to feed on Rubus.

Œdemasia concinna (Sm. & Abb.). Saunders, Ins. Inj. Frts. 62. Packard, For. Ins. 457. Webster, Bull. O. Exp. Sta. 45:167. [*Notodonta concinna*, Sm. & Abb. Harris, Ins. Inj. Veg. 425.] On apple, blackberry, and other plants.

Schizura ipomeæ, Doub. Packard, For. Ins. 155. Dyar, Ins. Life, 3: 62. [*Cœlodasys biguttatus*, Pack.] On oak, maple and blackberry.

Schizura unicornis (Sm. & Abb.). Packard, For. Ins. 269. [*Notodonta unicornis*, Sm. & Abb. Harris, Ins. Inj. Veg. 424. Fitch, N. Y. Rept. 3: 363. *Cœlodasys unicornis*. Saunders, Ins. Inj. Frts. 80.] A general feeder.

FAMILY ENNOMIDÆ.

Cingilia catenaria (Cramer). Comstock, Man. Ins. 279. [*Zerene catenaria*, Cram. Packard, Mon. Geom. 218.—For. Ins. 783. *Caterva catenaria* (Cram). Coquillet, Papilio, 1: 56.] On blackberry and several other plants.

FAMILY GEOMETRIDÆ.

Aspilates coloraria, Fabr. Packard, Mon. Geom. 206. [*Aspilates atropunctaria*, Walk.] On leaves of Rubus.

Eucrostis chloroleucaria (Guen). Packard, Mon. Geom. 370. [*Nemoria chloroleucaria*, Guen.] On red raspberry.

Eupithecia implicata, Walk. *Var. interrupto-fasciata*, Pack. [*Eupithecia interrupto-fasciata*. Thomas, Ill. Rep. 11:23. Saunders, Ins. Inj. Frts. 352. Coquillet, Papilio, 1: 56.] On fruit of currant and raspberry ; also on flower of clover and other plants.

Microgonia limbaria, Haw. [*Nematocampa filamentaria*, Guen. Packard, Mon. Geom. 471.—For. Ins. 182. Saunders, Ins. Inj. Frts. 167. Forbes, Ill. Rep. 13:79.] On raspberry.

FAMILY CYMATOPHORIDÆ.

Thyatira scripta (Gosse). [*Habrosyne scripta*, Gosse. Thaxter, Papilio, 3:10.] Eggs found on raspberry leaves.

FAMILY NOCTUIDÆ.

Acronycta Americana, Harris. French, Ill. Rep. 7:200. [*Apatela Americana* (Harr.). Harris, Ins. Inj. Veg. 436. Packard, For. Ins. 397. Hulst, Ent. Amer. 4:85.] On blackberry; a general feeder.

Acronycta brumosa, Guen. French, Trans. Ill. Hort. Soc. 1881:194. [*Apatela brumosa* (Guen). Coquillet, Papilio, 1:56. Saunders, Ins. Inj. Frts. 313.] On raspberry leaves.

Acronycta oblinita, Sm. & Abb. [*Apatela oblinita* (Sm. & Abb.). Saunders, Ins. Inj. Frts. 325.] A general feeder.

Acronycta spinigera, Guen. [*Apatela spinigera* (Guen.). Thaxter, Psyche, 2:121.] On blackberry; a general feeder.

Acronycta xyliniformis, Guen. [*Acronycta xylinoides*, Guen. Riley, Mo. Rep. 5:126. *Apatela xyliniformis* (Guen). Thaxter, Papilio, 3:17.] On blackberry; a general feeder.

Amphipyra pyramidoides, Guen. Saunders, Canad. Ent. 7:14. Comstock, Man. Ins. 302. [*Pyrophila pyramidoides* (Guen). Saunders, Ins. Inj. Frts. 274. French, Trans. Ill. Hort. Soc. 1881:195. Webster, Bull. O. Exp. Sta. 45:177.] On grape, raspberry, plum and other plants.

Hydræcia nitela (Guen). [*Gortyna nitela*, Guen. LeBaron, Ill. Rep. 3:141. Smith, Ill. Rep. 7:112. Lintner, N. Y. Rep. 1:110. Saunders, Ins. Inj. Frts. 334. Webster, Bull. O. Exp. Sta. 45:176.] Boring in the stems of cereals and many other plants.

Hyppa xylinoides (Guen.). Lintner, N. Y. Rept. 4:138. [*Hadena xylinoides*, Guen. Saunders, Canad. Ent. 2:33.] A general feeder; taken on raspberry.

Mamestra picta; Harris. Lintner, N. Y. Rep. 4:16.—5:206. [*Ceramica picta* (Harris). French, Ill. Rep. 7:226.] A general feeder; reported on raspberry and currant.

Noctua fennica, Tausch. Webster, Bull. O. Exp. Sta. 45:175. [*Agrotis fennica* (Tausch.). Fletcher, Ins. Life 3:247.] A general feeder; primarily on clover.

Prodenia ornithogalli, Guen. [*Prodenia lineatella*, Harv. French, Trans. Ill. Hort. Soc. 1881:195.—Canad. Ent. 13:24.] Feeds on raspberry in confinement.

Pyrrhia umbra (Hübn.). Forbes, Ill. Rep. 14:88. [*Heliothis exprimens* (Walk.). French, Ill. Rep. 7:233. *Pyrrhia exprimens*, Walk. Edwards and Elliott, Papilio, 3:135.] On Desmodium, smartweed, rose and blackberry.

Scopelosoma sidus, Guen. Packard, For. Ins. 116. [*Scopelosoma vinulenta*, Grote. Thaxter, Canad. Ent. 16:32.] On blackberry.

FAMILY ARCTIIDÆ.

Haploa Lecontei (Boisd.). [*Callimorpha Lecontei*, Boisd. Forbes, Ill. Rep. 15:2. *Var. fulvicosta*, Clem. LeBaron, Ill. Rep. 2:47. Saunders, Ins. Inj. Frts. 197.] On buds and leaves of raspberry, peach and other plants.

Hyphantria cunea, Dru. Comstock, Man. Ins. 32. Riley, Rep. U. S. Dept. Agr. 1886:518. Packard, For. Ins. 244. [*Hyphantria textor*, Harris. Saunders, Ins. Inj. Frts. 71.] The Fall Web-worm; feeds on more than 100 different species of plants.

Pyrrharctia Isabella, Sm. & Abb. Comstock, Man. Ins. 322. Webster, Bull. O. Exp. Sta. 45:162. Harris, Ins. Inj. Veg. 355. A general feeder.

FAMILY SPHINGIDÆ.

Paonias excæcatus (Sm. & Abb.). [*Smerinthus excæcatus*, Sm. & Abb. Saunders, Ins. Inj. Frts. 85. Beutenmuller, Ent. Amer. 1:196.—Can. Ent. 23:14. Dimmock, Psyche, 4:282. Packard, For. Ins. 487.] A general feeder.

FAMILY BOMBYCIDÆ.

Bombyx mori, Linn. Comstock, Man. Ins. 340. [*Sericaria mori* (Linn). Edwards, Bull. U. S. Nat. Mus. 35:67. Jaeger, Life N. Am. Ins. 146.] The silk worm. It has been reported, though not on the best of authority, that it will feed on Rubus.

Euproctis chrysorrhœa (Linn). Fernald and Kirkland, Special Bull. Mass. Hatch. Exp. Sta. 1897. [*Bombyx chrysorrhoea*, Linn.] A general feeder, preferring the pear.

FAMILY CITHERONIIDÆ.

Anisota senataria (Smith & Abb.). Packard, For. Ins. 124. Lintner, N. Y. Rep. 5:192. [*Dryocampa senatoria* (Sm. & Abb.). Riley, Amer. Ent. 2:26.] On oak; eggs reported on raspberry, but perhaps accidental.

FAMILY SATURNIIDÆ.

Automeris io (Fabr.). Comstock, Man. Ins. 351. [*Hypercheria io* (Fabr.). Goodell, Canad. Ent. 11:78. Saunders, Ins. Inj. Frts. 209.—Rep. Ent. Soc. Ont. 10:75. Riley, Mo. Rep. 5:133.] A general feeder.

Samia cecropia, Linn. Comstock, Man. Ins. 356. [*Attacus cecropia* (Linn.). Dimmock, Psyche, 4:276. Webster, Bull. O. Exp. Sta. 45:170. *Platysamia cecropia* (Linn.). Saunders, Ins. Inj. Frts. 73.—Rep. Ont. Ent. Soc. 1874:22.] A general feeder, over thirty different genera being included among its food plants.

FAMILY LASIOCAMPIDÆ.

Clisiocampa Californica, Packard, For. Ins. 119. Stretch, Papilio, 1:64. On oak and blackberry.

FAMILY NYMPHALIDÆ.

Polygonia comma (Harris). Comstock, Man. Ins. 404. [*Vanessa comma*, Harris. Ins. Inj. Vig. 300. *Grapta comma* (Harris). Packard, For. Ins. 241. Webster, Bull. O. Exp. Sta. 45:158.] On elm, nettle basswood, etc.; also reported on blackberry.

Order Diptera

FAMILY CECIDOMYIDÆ.

Cecidomyia sp.? Webster, Bull. O. Exp. Sta. 45:188. In canes of *Rubus hispidus*, forming galls.

Lasioptera farinosa, O. S. Smith, Spec. Bull. N. J. Exp. Sta. N:13. Webster, Bull. O. Exp. Sta. 45:188. Osten Sacken, Mon. Dip. N. A. 1:204. [*Cecidomyia farinosa* (O. S.).] Forming galls on midrib of the leaves and tips of young canes of blackberry.

Dipterous Larva, undetermined. Feeding within buds of *Rubus odoratus*, at Ithaca, N. Y., destroying the floral organs and preventing many of the buds from opening.

Order Coleoptera

FAMILY COCCINELLIDÆ.

Anatis 15-punctata (Oliv.). [*Coccinella 15-punctata*, Oliv. LeBaron, Ill. Rep. 5:183.] On fruit of raspberry.

FAMILY NITIDULIDÆ.

Carpophilus brachypterus, Say. Webster, Ins. Life, 2:258.—Bull. O. Exp. Sta. 45:191. In fruit of raspberry.

FAMILY ELATERIDÆ.

Limonius auripilis, Say. Webster, Ins. Life, 2:258. Say, Amer. Entomology, 2:112. On ripe raspberry fruit.

Melanotus communis, Gyll. Walsh, Pract. Ent. 2:119. On ripe fruit of raspberry.

Monocrepidius vespertinus, Fabr. Walsh, Pract. Ent. 2:119. On ripe raspberries.

FAMILY SCARABÆIDÆ.

Anomala binotata, Gyll. Thomas, Ill. Rep. 6:105. Webster, Bull. O. Exp. Sta. 45:197. On flowers of blackberry.

Cotalpa lanigera, Linn. Packard, For. Ins. 274. Forbes, Ill. Ent. Rep. 13:146. Saunders, Ins. Inj. Frts. 155. Fletcher, Rep. Ent. Soc. Ont. 1879:70. Lockwood, Amer. Nat. 1869, 186, 441. A general feeder, the beetle attacking the leaves and the larvæ the roots of plants.

FAMILY CHRYSOMELIDÆ.

Bassareus mammifer, Newm. Beutenmuller, Ent. Americana, 6:175. On blackberry.

Chelymorpha argus, Leich. Saunders, Ins. Inj. Frts. 315. Webster, Bull. O. Exp. Sta. 45:204. A general feeder.

Chlamys plicata, Fabr. Riley, Mo. Rep. 6:128. Packard, Guide, 510. Webster, Bull. O. Exp. Sta. 45:200. On blackberry and other plants.

Cryptocephalus binomis, Newm. Beutenmuller, Ent. Amer. 6:175. On blackberry.

Cryptocephalus quadruplex, Mim. Webster, Bull. O. Exp. Sta. 45:201. On blackberry.

Cryptocephalus venustus, Fabr. Beutenmuller, Ent. Amer. 6:175. On blackberry.

Diabrotica 12-punctata. Oliv. Riley and Howard, Ins. Life 1:58. Riley, Ins. Life 4:104. Garman, Psyche, 6:28. Webster, Bull. O. Exp. Sta. 45:202. The Southern Corn Root-worm. On raspberry.

Crepidodera cucumeris (Harris). Saunders, Ins. Inj. Frts. 317.–364. Comstock, Man. Ins. 578. [*Haltica cucumeris* (Harris). French Trans. Ill. Hort. Soc. 1881:198. Thomas, Ill. Ent. Rep. 6:167. *Epitrix cucumeris*, Harris. Horn, Trans. Amer. Ent. Soc. 16:245.] The Cucumber Flea-beetle. On raspberry, vegetables, etc.

Pachybrachys carbonarius, Hald. Webster, Bull. O. Exp. Sta. 45:202. On blackberry.

Paria 4-notata, Say. Webster, Bull. O. Exp. Sta. 45:202. On raspberry and blackberry.

Tymnes tricolor, Fabr. Beutenmuller, Ent. Amer. 6:176. On blackberry.

Family Rhynchitidæ.

Rynchites bicolor, Fabr. LeConte, Rhynchit. of Amer. 7. Cassidy, Bull. Colo. Exp. Sta. 6:18. Comstock, Man. Ins. 591. On rose and raspberry.

Family Otiorhynchidæ.

Otiorhynchus singularis, Linn. Hamilton, Trans. Amer. Ent. 21:402. [*Otiorhynchus picipes*, Fabr. Packard, Rep. Ins. of Mass. 2:14. Riley, Amer. Ent. 3:127.] Destructive to raspberry and other plants in England. Reported in America by Packard, l. c.

Order Hymenoptera

Family Tenthredinidæ.

Blennocampa pauperа (Prov.). Webster, Bull. O. Exp. Sta. 45:152. [*Selandria paupera*, Provancher, Faun, Ent. Can. 2:742.] On raspberry.

Fenusa rubi (Forbes). Webster, Bull. O. Exp. Sta. 45:152. [*Metallus rubi*, Forbes. Ill. Rep. 14:87.] Mining in leaves of blackberry.

Harpiphorus varianus, Nort. (?). Webster, Bull. O. Exp. Sta. 45:153. Riley and Howard, Ins. Life. 2:239. Larvæ thought to be this species were found by Professor Webster on leaves of blackberry.

Family Uroceridæ.

Phyllœcus trimaculatus, Say. Smith, Rep. N. J. Exp. Sta. 1892:464. Norton, Trans. Amer. Ent. Soc. 2:345. Boring in the pith of raspberry and blackberry canes.

Family Cynipidæ.

Diastrophus Bassettii, Beutenmuller, Bull. Amer. Mus. Nat. Hist. 4:248. Forming galls on canes of *Rubus Canadensis*.

Diastrophus cuscutæformis, Osten Sacken, Proc. Ent. Soc. Phila. 2:39. Walsh and Riley, Amer. Ent. 1:188. Saunders, Ins. Inj. Frts. 319. Forming seed-like galls on canes of blackberry.

Diastrophus Kincaidii, Gillette, Canad. Ent. 25:110. Forming galls on twigs of *Rubus parviflorus*.

Diastrophus nebulosus, Osten Sacken, Proc. Ent. Soc. Phila. 2: 36. Riley, Amer. Ent. 2:159. Saunders, Ins. Inj. Frts. 318. Forming elongated pithy galls on canes of blackberry.

Diastrophus radicum, Bassett, Canad. Ent. 2: 98. Ashmead, Trans. Amer. Ent. Soc. 14: 134. Forming galls on the roots of blackberry.

Diastrophus turgidus, Bassett, Canad. Ent. 2: 99. Ashmead, Trans. Amer. Ent. Soc. 14:134. Forming galls on the canes of red raspberry.

Rhodites radicum, Osten Sacken, Proc. Ent. Soc. Phila. 2: 42–46. Riley, Amer. Ent. 2:181. Saunders, Ins. Inj. Frts. 304. Forming galls on the roots of rose, raspberry and blackberry.

Rhodites rosæ, Linn. (?) Beutenmuller, Bull. Amer. Mus. Nat. Hist. 4: 248. Forming woolly galls on stems of rose and blackberry.

Cynipid Leaf Gall, undetermined. Webster, Bull. O. Exp. Sta. 45:157. Forming galls on the leaves of blackberry.

FAMILY MYRMICIDÆ.

Solenopsis fugax (Latr.). Webster, Ins. Life, 2: 257.—Bull. O. Exp. Sta. 45: 157. A yellow ant, burrowing in ripe blackberries.

FAMILY PEMPHREDONIDÆ.

Stigmus fraternus, Say. Webster, Bull. O. Exp. Sta. 45:158. Packard, Proc. Ent. Soc. Phila. 6: 387. Burrowing in dead canes of raspberry.

FAMILY CRABRONIDÆ.

Crabro sexmaculatus (Say). Couper, Canad. Ent. 1: 77. A sand wasp, burrowing in canes of raspberry.

FAMILY ANDRENIDÆ.

Prosopis sp., Smith. Kingsley's Stand. Nat. Hist. 2: 536. Boring in the stems of bramble.

FAMILY APIDÆ.

Ceratina dupla, Say. Webster, Bull. O. Exp. Sta. 45:158. Comstock, Man. Ins. 669. Burrowing and nesting in pithy stems of bramble and other plants.

CHAPTER X

DISEASES OF THE BRAMBLES

How to control the diseases which prey upon plants is an important question in all branches of agriculture, and in berry-growing there is particular need of this inquiry. Cultivators far and near are being driven out of the business by certain of these diseases, yet no one is able to offer positive remedies. The reasons are various, one being, the nature of the plants and fruits themselves, neither of which can be treated with remedies or preventives during a considerable portion of the active season of depredation, without injuring the fruit or rendering it unfit for use. Another and more potent reason is the lack of a sufficient number of skilled men to study the complete life-history of the maladies, with a view to ascertaining their weak points and the means of meeting them. Few people not engaged in the work can appreciate the amount of careful, accurate work often required to trace out these things. Furthermore, only a trained specialist, who can interpret and understand what he sees, can expect to cope with them. It is to be hoped that careful study and field experiments may in time make it possible to undertake berry-culture without fear that these enemies will thwart the best efforts of the grower.

This book can add little to what is already known concerning the numerous fungous enemies of bush-fruits. The aim of the present chapter is to present in brief form the more important facts known about those which prove most serious, together with a few of the most accessible references to what has been written concerning them.

THE IMPORTANT FUNGOUS DISEASES

Red Rust, Yellows

Puccinia interstitialis (Schlecht.) Tranzschel, Hedwigia, 1893: 257.

Cæoma interstitiale, Schlecht. *Æcidium nitens*, Schw. *Cæoma (Æcidium) luminatum*, Link. *Uredo interstitialis*, Schlecht. *Uredo lucida*, Dietr. *Puccinia Peckiana*, Howe, Rep. N. Y. Mus. 23: 57. *Puccinia tripustulata*, Peck, Rep. N. Y. Mus. 24: 91.

Order Uredineæ.

Saccardo, Syll. Fung. 7: 699, 866 and 9: 331. Burrill, Par. Fung. Ill. 178, 220. Newcombe, Jour. Myc. 6: 106. Clinton, Bull. Ill. Exp. Sta. 29: 273–300.

On leaves of *Rubus nigrobaccus (villosus)*, *R. villosus (Canadensis)*, *R. occidentalis*, *R. cuneifolius*, *R. strigosus*, *R. triflorus*, *R. trivialis*, *R. hispidus*, *R. saxatilis* and *R. arcticus*.

This fungus was first described by Schlechtendal in 1820 as *Cæoma interstitiale*. The relationship between the mature and immature forms was independently established by Tranzschel in Germany, and by Clinton in the United States, in 1893.

The appearance of this disease is well known, both on wild and cultivated plants. The orange-red color of the under surface of the infested leaves is due to the abundance of sori, which produce the orange-red spores by means of which the disease may be spread from plant to plant. These are connected in chains, and form a waxy layer over the affected portions. The mycelium of the fungus, which corresponds to the roots of higher plants, is perennial, living throughout the winter in the canes and roots, and a plant once attacked is doomed. Its vitality is sapped, and its condition is soon manifest by the numerous small, weak canes which spring up.

Treatment.—Diseased plants should be rooted up and burned as soon as discovered, to prevent the spore formation and consequent spread of the disease. This, if promptly done, is a practical remedy. Spraying can only be of use in preventing new infection. If employed against the anthracnose, it will also be of use against red rust spores, if they exist.

Fig. 44. Anthracnose inciting knotty growth on red raspberry.

ANTHRACNOSE (Fig. 44)

Glœosporium Venetum, Speg.

Glœosporium necator, Ell. and Ev. Jour. Myc. 3: 129.

Order Melanconieæ.

Saccardo, Syll. Fung. 3: 706, and 10: 450. Burrill, Agr. Review, 1882: Nov. Galloway, Rep. U. S. Dept. Agr. 1887: 357. Paddock, Bull. New York State Exp. Sta. 124: 261-274.

This is unquestionably one of the most serious enemies to raspberry and blackberry culture now known. The disease was first described by an Italian botanist, M. Spegazinni, from leaves of *Rubus Chamæmorus*. Its first mention in this country was in the Agricultural Review for November, 1882, by T. J. Burrill, who referred to it as the Raspberry Cane Rust. In 1887, Messrs. Ellis & Everhart, in The Journal of Mycology, Vol. III, p. 129, described the disease as a new species under the name *Glœosporium necator*.

The gray discolored spots caused by this fungus are well known to all berry growers. They are found on all parts of the plant above ground. On the leaf surface, however, they are not easily distinguished from those of Cylindrosporium and Septoria. They often become so numerous that they destroy a large part of the living cane and greatly weaken or even kill it. The disease is especially liable to work injury just at the ripening period. On red raspberries its presence sometimes incites a warty growth like that shown at Fig. 44.

The mycelium, creeping between the plant cells, causes their destruction and the consequent appearance of the dead spots.

Only the bark and cambium layer are affected as a rule, the mycelium rarely entering the wood to any extent. Near the center of the spots the mycelium threads unite to form a dense tuft, made up of the slender club-shaped basidia on which the spores are borne. These basidia are formed beneath the surface, but soon rupture it and form a minute globule outside, being covered with a clear, gelatinous substance which holds the spores in place. When brought in contact with water, this substance readily dissolves and allows the spores to float away. These germinate readily in water, and many of them soon find lodgment in healthy portions of tissue and form new centers of infection. If the water which sets them free from the inclosing mass soon evaporates, they are readily distributed by the wind.

Treatment.—Experiments at Washington have shown that the spores germinate most readily in pure water. It has also been observed that the spread of the disease is more rapid in wet weather than in dry weather. For these reasons it has been recommended that the plants be so set and trained that they shall have plenty of sunlight and air. I have frequently observed neglected plantations, or others in which no pinching of the tips had been done to induce branching, which were very free from this disease. How much of this may have been due to the fact of the long, slender growth of canes and consequent absence of shade and moisture, I cannot say. Old wood should be removed and burned as soon as fruiting is over. The removal of diseased wood in autumn or spring will also aid, but this is seldom a feasible plan, for the fungus is so indiscriminate in its attacks that to remove all diseased wood would often be to remove nearly all prospect of fruit. Experiments at the Ohio, Minnesota and New York State Experiment Stations have all shown that the disease may be controlled by spraying with Bordeaux mixture. The New York experiments,* while showing beyond question that the disease may be controlled, did not show a sufficient increase in fruit to cover the expense. It is often recommended to treat the bushes with a strong solution of copper sulphate early in spring, before the leaves start, but their results

*Bull. 124.

seem to indicate that this is unnecessary. In setting a new plantation, care should be used to secure plants free from the disease. If not wholly free, cut the old wood away as close as possible. Spraying the young shoots when they have reached a height of six or eight inches, and once or twice thereafter, will prove an additional precaution, and the cost at that time will be slight. If, then, the plantation is given good care, it is not likely to seriously suffer until after it has produced its best crops. The longer the bushes remain, the more troublesome is the disease likely to become. It will, therefore, generally be more satisfactory to remove the plants after they have borne their third crop. If spraying is resorted to, it should be remembered that the mycelium remains alive in the canes during the winter, and that spraying can in no way cure the disease. It can only prevent, if thoroughly done, the germination of spores as they are produced.

Glœosporium Rubi, Ell. and Ev. Jour. Myc. 4: 52. Saccardo, Syll. Fung. 10: 450.

Found on leaves of *Rubus nigrobaccus*, associated with *Puccinia interstitialis*, by Prof. S. M. Tracy, at Starkville, Miss.

Although closely related to the preceding species, it seems to be less common and of less importance. It is not easily distinguished from the other, and both should be treated alike.

Leaf-Spots

Septoria Rubi, West.—Order Sphæropsideæ: Family Sphærioideæ.

Saccardo, Syll. Fung., 3: 486. Martin, Jour. Myc., 3: 73. Goff, Rept. U. S. Dept. Agr., 1890: 399.

On leaves of most species of the genus.

The following varieties have been named:

Septoria Rubi pallida, Ell. and Howl. Martin, Jour. Myc. 3: 73; on leaves of *Rubus hispidus*.

Septoria Rubi alba, Peck. Rept. N. Y. Mus. 34: 57; on *Rubus nigrobaccus*, *R. villosus*, and *R. trivialis*.

This is one of the commonest species affecting the genus, and when abundant is without doubt injurious to the plant, owing to the amount of leaf tissue which is killed by it and thus prevented

from performing its natural function. The small brown or light colored spots on the leaves caused by this and *Cylindrosporium Rubi* are familiar to all.

Treatment.—Few experiments with fungicides have yet been made, and these are somewhat conflicting. Treatment with the Bordeaux mixture in Mississippi in 1889 was reported successful, but experiments made by Goff, with Bordeaux mixture and a mixture consisting of equal parts of ammoniated copper sulphate and ammonium carbonate, were on the whole unsatisfactory. This was used in the proportion of 12 ounces of the mixture to 22 gallons of water. Professor Goff's conclusions are quoted here:

"The foliage of the raspberry is delicate, and cannot endure applications of a corrosive nature. The foliage of the blackberry, though more resistant than that of the raspberry, is more susceptible to injury than that of the apple. None of the treatments given are to be recommended for the raspberry, and of the materials used, only the copper carbonate solution can be pronounced beneficial in the case of the blackberry."

Cylindrosporium Rubi, Ell. and Morgan.—Order Melanconieæ.
Ellis & Everhart, Jour. Myc. 1: 129. Saccardo, Syll. Fung. 10: 500.

On leaves of cultivated raspberry and blackberry.

This species is very similar to *Septoria Rubi* in many of its characters; it differs from it chiefly in that the spores of Septoria are borne within a more or less thick-walled and dark-colored conceptacle, while in Cylindrosporium there is no surrounding conceptacle. The two species are often associated, and cannot be distinguished by the naked eye.

Peronospora Rubi, Rabenh.—Order Phycomyceteæ. Family Peronosporaceæ.
Rabenhorst, Fung. Europæi, 2676. Saccardo, Syll. Fung. 7: 263. Halsted, Bot. Gaz. 15: 179, 323.—Amer. Garden 1890: 688.

On leaves of raspberries and blackberries.

Although a common fungus in Europe, this species was first reported in the United States by Professor Halsted, in 1890, from New Jersey, and later from Long Island. It develops on the under surface of the leaves, and is difficult to detect upon rasp-

berries, so closely does it resemble the tomentum of the leaf. Upon the blackberry its appearance is marked, causing a red discoloration of the upper surface of the leaf, as if it were ripening. Halsted calls attention to the fact that this is liable to cause serious trouble to our berry growers, and suggests the advisability of appropriations to stamp out such dangerous species while still confined to limited areas.

Leaf-Rusts

Phragmidium Rubi (Pers.) Winter.—Order Uredineæ.

For synonymy, see Sacc. Syll. Fung. 7: 745. Winter, Die Pilze, 1: 230. Burrill, Parasitic Fung., Ill., 1: 208.

On leaves of *R. nigrobaccus*, and in Europe on *R. fruticosus*, *R. cæsius*, *R. saxatilis* and *R. arcticus*.

The uredospore form appears like a coarse dusting of light-colored powder on the under surface of the leaves; the teleutospore stage appears in the form of black dots raised above the surface. Although this never seems to have been reported as seriously injurious, the abundance with which it is sometimes found seems to indicate that it might become so. Its position on the under side of the leaves would render it difficult to combat.

Phragmidium Rubi-idæi (Pers.) Karst.

For synonymy, see Saccardo, Syll. Fung. 7: 748. Winter, Die Pilze, 1: 231. Burrill, Par. Fung. Ill. 207.

On leaves, petioles and peduncles of *Rubus Idæus*, *R. strigosus*, *R. odoratus*, *R. parviflorus*, *R. occidentalis*, and *R. cuneifolius*.

This is closely related to the preceding species, and is the same in outward appearance; it occurs on raspberries, however, while the other is found chiefly on blackberries.

Sphærotheca Humuli (D. C.) Burrill.

Burrill, Par. Fung. Ill. 2: 400. Ellis and Everhart, Pyren. 5. [*Erysiphe Humuli*, D. C., Flore Française, 6: 106. *Sphærotheca Castagnei*, Lev. in part. Saccardo, Syll. Fung. 1: 4.]

Order Pyrenomyceteæ.—Family Perisporiaceæ.

Known to occur on leaves of *Rubus odoratus*, *R. triflorus*, *R. strigosus*, *R. hispidus*, and other species of Rosaceæ.

Treatment.—Although not often mentioned as a disease of

Fig. 45. Double-blossom, a disease of the blackberry.

economic importance, Burrill states that it sometimes does considerable damage to raspberries. It is one of the powdery mildews, and if abundant may be treated with fungicides.

Double-blossom (Fig. 45)

Fusarium (?) Rubi (Wint.) Sacc.

Saccardo, Syll. Fung. 10: 220. *Fusisporium Rubi*, Winter, Hedw. 24: 258. Seymour, Rep. Minn. Hort. Soc. 14: 220. Ellis and Everhart, N. A. F. 1645. Seymour and Earle, Econ. Fung. 25.

Order Hymenomyceteæ: Family Tuberculariеæ.

On blossoms of cultivated blackberry.

This fungus was first worked out by F. S. Earle, from Cobden,

Ill. He sent specimens of it to Dr. Winter, of Germany, who described it as a new species, referring it provisionally to the genus Fusisporium. It is well known to growers in certain sections under its common name "Double-Blossom." It has been especially troublesome on the Wilson Early blackberry, and in portions of New Jersey has caused immense damage, often ruining entire fields.

Treatment.—Few, if any, experiments have been made in trying to combat it with fungicides, and it will probably be found difficult to control in that manner. In fact, until a careful study of its life history has been made, any attempt to suggest a remedy can be little more than guess work.

Brown Rot

Monilia fructigena, Pers.

Saccardo, Syll. Fung. 4: 34. Arthur, Rept. N. Y. State Exp. Sta. 3: 254. Smith, Jour. Myc. 5: 123. Galloway, Rept. U. S. Dept. Agr. 1888: 349. Humphrey, Bot. Gaz. 18: 85.

Order Hyphomyceteæ. Family Mucedineæ.

On fruit of apples, peach, plum, cherry, etc.

This is the well-known brown rot of the stone fruits. Although injurious chiefly on this class of fruits, Professor Arthur has induced it to grow on ripe blackberries, and it may be one of the forms which hasten their destruction when over-ripe.

OTHER IMPORTANT DISEASES

Bacterial Disease (Fig. 46)

In addition to the fungous diseases mentioned, there are one or two maladies whose natures are not so well understood, but which promise to be serious enemies. The first of these is a bacterial disease affecting the canes. Its presence is shown by the appearance of dark purplish spots which have a comparatively regular outline and vary much in size, sometimes extending until a single spot wholly encircles the cane. They are perfectly smooth at first, but later the epidermis within the spots often becomes ruptured and slitted. Burrill has suggested that this may be identical with pear blight. As yet it is uncertain how much damage it may cause.

Fig. 46. Bacterial disease of raspberry.

Fig. 47. Root-gall of raspberry.

Crown-Gall (Fig. 47)

Woodworth, Bull. 99, Cal. Exp. Sta. Smith, Jour. Myc. 7: 376. Bailey, Bull. Cornell Univ. Exp. Sta. 74: 383; Bull. 117. Card, Bull. Nebr. Exp. Sta. 39: 131. Selby, Bull. Ohio Exp. Sta. 79: 110; 92: 208; 104: 211. Halsted, Rept. N. J. Exp. Sta. 1896: 413; 1898: 354. Toumey, Bull. 33, Ariz. Exp. Sta.

This disease is characterized by a rough, knotty growth about the stem at the surface of the ground or on the roots beneath. The knots or galls have a granular appearance, somewhat resembling, when young, the callus growth at the end of a cutting. When old, they look something like the black-knot of plums, but are not so dark in color. In Germany the disease is known as "Wurzelkropf." On the Pacific slope it has ruined thousands of trees, for its injury extends to fruit-trees as well as to brambles. It has there been given the name Crown-Gall, which is probably the best name to retain, though the trouble is not confined to the crown of the plant. Although a widespread disease, its cause has been discovered but recently. The trouble has often been attributed to the work of the gall-fly, *Rhodites radicum*, but the galls made by that insect are very different. Nematodes, or eelworms, have been so frequently associated with the galls that some have been led to think them the cause of the trouble.

Professor Toumey carried on an extended and careful series of studies at the Arizona Experiment Station which led him to the belief that the disease is due to the presence of a specific organism belonging to the slime-molds or Myxomycetes. Although many species of slime-molds are known in America, but one has heretofore been known to be parasitic, and that one was doubtfully placed in the group. As a class, the slime-molds belong to a very low order of plant-life and exist chiefly on decaying vegetable matter. The one responsible for the crown-gall is so unlike the others that Professor Toumey thinks it should be placed in an entirely new genus from any yet described. He, therefore, erects a new genus and species, giving the organism the name of *Dendrophagus globosus*.

Professor Toumey's experiments prove, as have experiments made by others, that the disease is readily transmitted from one plant to another. When minced galls were mixed with the soil in

which almond, peach and apricot plants were grown, large numbers of the young trees contracted the disease. Making incisions in the root or stem near the surface and inserting a particle of gall also communicated the disease. Seeds taken from diseased trees and planted in uncontaminated soil produced none of it

Treatment.—A paste consisting of two parts bluestone, one part copperas and three parts quicklime largely prevented the spread of the disease. When trees have become affected the galls at the crown can be removed and the wound painted with this preparation. By this means orchards have been kept in bearing which otherwise would have failed. Great care should be taken not to introduce the disease into a plantation. It may be readily spread by water, especially with irrigation, by the wind and by tillage. If plants which show galls are received from a nursery, Professor Toumey considers it insufficient to simply remove the ones which are diseased. He recommends destroying the entire lot.

Fig. 48. Cane-knot of blackberry.

CANE-KNOT. (Fig. 48.)

Bailey, Bull. Cornell Exp. Sta. 99: 427.

This is a disease of the same insidious, treacherous habit as the one just described. It is most common on blackberries, though perhaps not confined to them alone. It is manifest by numerous rough, warty knots upon the canes. These knots somewhat resemble the black-knot of plum in appearance, but with small, whitish eruptions surrounding the central knot. It is not common, but seems to be widespread, and in a few cases, at least, has wrought serious injury. A similar diseased condition is sometimes to be observed upon the canes of red raspberries, as a result or accompaniment of anthracnose.

The only treatment that can be recommended at present is to

avoid all plants showing indications of the disease, or to eradicate them at once, if found growing in the field. To combat a disease with the cause unknown is to fight an enemy in the dark. Yet many such problems confront the grower, for the solution of which he must look to the student and the specialist.

LESS PROMINENT DISEASES

In addition to the species mentioned in the preceding pages, many others have been reported upon different Rubus hosts. The greater part of these are of little or no economic importance. The following enumeration is designed as a mere reference list for the benefit of the student. The species are arranged approximately in systematic order, according to Saccardo's classification, with the most available references to the literature of each. The hosts given are simply those upon which the species is known to have been found. Though as full as practicable to make it, no claim is made to completeness in the enumeration, either of species or of hosts. Since the genus Rubus is so largely a European one, and since this work aims to deal with it only as found in North America, only those species reported from North America are included.

Little attempt has been made to decide questions of nomenclature or synonymy. That battle is left for those better able to fight it. The nomenclature follows Saccardo's "Sylloge Fungorum," since that can be taken as a standard throughout, while most other works deal only with special groups, and hence are but fragmentary so far as this list is concerned.

Order Pyrenomyceteæ

FAMILY PERISPORIACEÆ.

Sphærotheca pannosa (Wallr.) Lev. Saccardo, Sylloge Fungorum 1:3. Ellis and Everhart, North American Pyrenomycetes 6. On leaves of different species of Rosa and Rubus.

Asterina rubicola, Ell. and Ev. Proc. Phil. Acad. 1890:219.—Pyren. 35. Saccardo, Syll. Fung. 9:384. On leaves of *Rubus strigosus* and *R. occidentalis*.

Asterella Pearsoni, Ell. and Ev. Saccardo, Syll. Fung. 9:395. [*Asterina Pearsoni*, Ell. and Ev. Jour. Myc. 1:92, 135.—Pyren. 42. Saccardo, Additamenta 10.] On canes of cultivated blackberry, Vineland, N. J.

Meliola manca, E. and M. Am. Nat. 17:1284. Ell. and Ev. Pyren. 47. Saccardo, Syll. Fung. 9:419.

Meliola sanguinea, Ell. and Ev. Jour. Myc. 2:42. Saccardo, Syll. Fung. 9:420. The two preceding species on leaves, stems and petioles of *R. trivialis*, Louisiana, and *R. nigrobaccus*, Alabama.

Capnodium elongatum, Berk and Desm. Saccardo, Syll. Fung. 1:75. Ell. and Ev. Pyren. 50. On leaves of many different plants.

FAMILY SPHÆRIACEÆ.

Valsa Rubi, Fuck. Peck, Rep. N. Y. Mus. 28:72. Saccardo, Syll. Fung. 1:109.

Valsa ceratophora, Tul. Ell. and Ev. Pyren. 461. The two preceding species on branches of *Rubus Canadensis* and other plants.

Valsa subclypeata, C. and P. Peck, Rep. N. Y. Mus. 27:109. Sacc. Syll. Fung. 1:126. Ell. and Ev. Pyren. 485. On leaves of *Rubus villosus*.

Valsa syngenesia, Fr. Sacc. Syll. Fung. 1:130. [*Diatrype Frangulae* (Pers.) Cooke, Handbook 2:816. *Diaporthe syngenesia* (Fr.) Fuck. Symb. 204. Ell. and Ev. Pyren. 442.] On branches of Rubus.

Valsa sepincola, Fuck. Sacc. Syll. Fung. 1:134. On dry branches of Rubus.

Gnomoniella melanostyla (DC.) Sacc. Syll. Fung. 1:419. [*Sphæria melanostyla*, DC. Fl. Fr. 6:129. *Gnomonia melanostyla* (DC.) Ell. and Ev. Pyren. 328.] On *Rubus odoratus* (Farlow and Seymour). Usually found on elm.

Physalospora eriostega glabrata (C. and F.) Sacc. Syll. Fung. 1:443. [*Botryosphæria fuliginosa* (M. and P.) Ell. and Ev. Pyren. 546.] On branches of *Rubus Idæus*, New Jersey.

Venturia Kunzei, Sacc. Syll. Fung. 1:588. On the upper surface of Rubus leaves yet living.

Diaporthe [*Chorostate*] *obscura* (Peck.) Sacc. Syll. Fung. 1:627. Ell. and Ev. Pyren. 441. [*Valsa obscura*, Peck. Rep. N. Y. Mus. 28:73.] On dead stems of *Rubus strigosus*, New York.

Diaporthe [*Tetrastaga*] *gallophila*, Ellis, Bull. Torr. Bot. Club, 8:90. Sacc. Syll. Fung. 1:667. Ell. and Ev. Pyren. 457. On dead canes of *Rubus nigrobaccus*, New Jersey.

Diaporthe Tetrastaga rostellata (Fr.) Nits. Sacc. Syll. Fung. 1: 667. Ell. and Ev. Pyren. 456. On branches of *Rubus nigrobaccus, R. idæus, R. parviflorus and R. vitifolius.*

Didymosphæria Manitobensis, Ell. and Ev. Pyren. 732. Sacc. Syll. Fung. 11: 313. On raspberry leaves.

Leptosphæria Doliolum (Pers.) DeNot. Sacc. Syll. Fung. 2: 14. Ell. and Ev. Pyren. 355. Common on dead stems of herbaceous plants ; also reported on Rubus.

Leptosphæria fuscella (B. and Br.) Ces. and DeNot. Sacc. Syll. Fung. 2: 30. Ell. and Ev. Pyren. 353. On dead stems of *R. strigosus.*

Clypeosphæria Notarisii, Fuck. Sacc. Syll. Fung. 2: 90. Ell. and Ev. Pyren. 736. Common on stems of Rosa, Rubus, etc.

Clypeosphæria Hendersonia (Ell.) Sacc. Syll. Fung. 2: 91. Ell. and Ev. Pyren. 410. [*Sphæria Hendersonia*, Ell. Grev. 5: 14. *Sphæria melantera*, Peck, Rep. N. Y. Mus. 29: 62.] On dead canes of black and red raspberry.

Metasphæria anisometra (Cooke and Hark). Sacc. Syll. Fung. 2: 163. Ell. and Ev. Pyren. 381. [*Sphæria anisometra*, Cooke and Hark. Grev. 9: 86. *Endophlœa anisometra* (Cooke and Hark.), Cooke, Grev. 17: 89.] On twigs of Rubus, Eucalyptus, Dracæna, and other plants.

Metasphæria sepincola (Fr. ?) Fuck. Sacc. Syll. Fung. 2: 164. Ell. and Ev. Pyren. 380. [*Sphæria sepincola*, Fr. Syst. Myc. 2: 498.] On dead stems of Rosa and Rubus.

Sphæria rubincola, Schw. Sacc. Syll. Fung. 2: 380. [*Valsa rubincola* (Schw.). Ell. and Ev. Pyren. 473.] On branches of Rubus, Bethlehem, Pa.

Sphæria cæspitulans, Schw. Sacc. Syll. Fung. 2: 406. Ell. and Ev. Pyren. 748. On branches of cultivated red raspberries.

Sphæria obtusa, Schw. Sacc. Syll. Fung. 2: 423. Ell. and Ev Pyren. 753. On dead canes of *R. nigrobaccus.*

Sphæria Ruborum, Schw. Sacc. Syll. Fung. 2: 423. Ell. and Ev., Pyren. 752. Common on dead canes of Rubus.

Family Hypocreaceæ.

Hypocrea rufa (Pers.) Fr. Sacc. Syll. Fung. 2: 520. Ell. and Ev. Pyren. 78. [*Sphæria rufa*, Pers., Syn. Fung. 13.] Common on decaying wood and bark.

Gibberella Saubinetii (Mont.) Sacc. Syll. Fung. 2: 554. Ell. and Ev. Pyren. 120. On dried stems of many plants.

Family Lophiostomaceæ.

Lophiotrema præmorsum (Lasch.) Sacc. Syll. Fung. 2: 681. [*Lophiostoma præmorsum* (Lasch) Ell. and Ev. Pyren. 233. *Lophiostoma Scrophulariæ*, Peck, Rep. N. Y. Mus. 28: 76.] On dead stems of Rubus and many herbaceous plants.

Lophiostoma bicuspidatum, Cooke, Handbook Brit. Fung. 2: 848. Sacc. Syll. Fung. 2: 707. Ell. and Ev. Pyren. 233. On decorticated twigs of *Rubus odoratus.*

FAMILY HYSTERIACEÆ.

Glonium macrosporum, Tracy and Earle. Underwood and Earle, Ala. Fung. 197. On *Rubus nigrobaccus*.

Hysterium angustatum, Alb. and Schw. Sacc. Syll. Fung. 2: 744. Ell. and Ev. Pyren. 693. [*Hysterium pulicare*, var. *angustatum* (A. and S.) Fr. Syst. Myc. 2: 580. *Hysterium Eucalypti*, Phil. and Hark. Grev. 13: 23.] On branches and bark of Rubus, Pirus, and other plants.

Hysterium confluens, Schw. Sacc., Syll. Fung. 2: 756. Perhaps only a form of *Hypoderma commune* (Fr.). Ell. and Ev. Pyren. 711. On Rubus canes, Bethlehem, Pa.

Hypoderma virgultorum, DC. Sacc. Syll. Fung. 2: 786. Ell. and Ev. Pyren. 711. [*Hysterium Rubi*, Pers. Obs. Myc. 1: 84.] On dead canes of Rubus.

Hysterographium Ruborum, Cooke. Sacc. Syll. Fung. 9: 1123. [*Hysterium viticolum*, C. and P. Disc. U. S. 33. Grev. 4, t. 68. *Hysterographium Mori viticolum*, C. and P. Ell. and Ev. Pyren. 704. *Hysterographium viticolum Ruborum*, Cooke. Sacc. Syll. Fung. 2: 782.] On canes of *Rubus nigrobaccus*.

Order Sphæropsideæ

FAMILY SPHÆRIOIDEÆ.

Phyllosticta Ruborum, Sacc. Syll. Fung. 3: 8. On weak leaves of *Rubus strigosus* and others.

Phyllosticta bicolor, Peck, Rep. N. Y. Mus. 43: 26.—Jour. Myc. 6: 134. Sacc. Syll. Fung. 10: 110. On leaves of *Rubus odoratus*.

Phyllosticta variabilis, Peck, Rep. N. Y. Mus. 35: 138. Sacc. Syll. Fung. 10: 110. On leaves of *Rubus odoratus*.

Phoma lethalis, Ell. and Martin. Farlow and Seymour, Host. Ind. 198. Now thought to be the pycnidial stage of *Clypeosphæria Hendersonia*. On *Rubus villosus*.

Phoma herbarum, West. Sacc. Syll. Fung. 3: 133. On herbaceous stems in general.

Vermicularia compacta, C. and E. Grev. 5: 54. Sacc. Syll. Fung. 3: 222. On branches of Rubus, grape, and dahlia.

Vermicularia effusa, Schw. Sacc. Syll. Fung. 3: 222. On badly decayed Rubus stems.

Cytospora Rubi, Schw. Sacc. Syll. Fung. 3: 252. On young twigs of red raspberry.

Sphæropsis rubicola, C. and Ell. Sacc. Syll. Fung. 3: 294. On canes of red and black raspberry.

Diplodia Ruborum (Schw.) Sacc. Syll. Fung. 11: 518. [*Sphæria Ruborum*, Schw. Syn. Am. Bor. 1677. Sacc. Syll. Fung. 2: 423. *Diplodia Rubi*, Fr. (?). Sacc. Syll. Fung. 3: 339.] On canes of *Rubus strigosus*.

Ascochyta Rubi, Lasch. Farlow and Seymour, Host Index 36. On *Rubus villosus*.

Darluca Filum (Biv.) Cast. Sacc. Syll. Fung. 3:410. On Uredineæ growing on Rubus and many other plants.

Hendersonia platypus, Ell. and Ev. Torr. Bot. Club 1884:73. Sacc. Syll. Fung. 3:420. On twigs of *Rubus nigrobaccus* and *R. villosus*.

Hendersonia sarmentorum, West. Sacc. Syll. Fung. 3:420—10:321. On branches of Rubus and many other plants.

Hendersonia Rubi, West. Sacc. Syll. Fung. 3:424.—10:321. On branches of *Rubus vitifolius*.

Rhabdospora Rubi, Ell. Jour. Myc. 3:90. Sacc. Syll. Fung. 10:388. On canes of *Rubus strigosus*.

Family Leptostromaceæ.

Leptothyrium vulgare (Fr.) Sacc. Syll. Fung. 3:633. On stems of Rubus and other plants.

Leptostroma virgultorum rubinum, Karst. Sacc. Syll. Fung. 3:639. On stems of *Rubus arcticus* and *R. Chamæmorus*.

Discosia Artocreas (Tode) Fr. Sacc. Syll. Fung. 3:653. On leaves of Rubus and many other genera.

Order Melanconieæ

Myxormia atro-viridis, B. and Br. Sacc. Syll. Fung. 3:734. On Rubus canes in Alabama.

Libertella Rosæ, Desm. Sacc. Syll. Fung. 3:745. [*Næmospora Rosæ* (Desm.) Fr. S. M. 3:479.] On weak or dead canes of *Rubus vitifolius* and other Rosaceæ.

Melanconium griseum, Schw. Sacc. Syll. Fung. 3:750. On branches of cultivated red raspberries.

Coryneum microstictum, B. and Br. Sacc. Syll. Fung. 3:775. On weak or dead branches of Rubus and other plants.

Order Hyphomyceteæ

Family Mucedineæ.

Botrytis patula, Sacc. and Berlese. Sacc. Syll. Fung. 4:125. Kellerman, Jour. Myc. 1:106. On dead branches of *Rubus strigosus*, willows, etc.

Family Dematieæ.

Cladosporium herbarum (Pers.) Link. Sacc. Syll. Fung. 4:350. On all parts of different plants the world over.

Cercospora rosicola, Pass. Sacc. Syll. Fung. 4:460. On leaves of roses and blackberry.

Cercospora Rubi, Sacc. Syll. Fung. 4:461. On leaves of *Rubus trivialis* and *R. cuneifolius*.

Macrosporium punctiforme, Berk. Sacc. Syll. Fung. 4:531. On dead canes of *Rubus occidentalis*.

Macrosporium Rubi, Ellis, N. A. F. 544. Sacc. Syll. Fung. 10:673. On leaves of *Rubus hispidus*

Septosporium prælongum, Sacc. Syll. Fung. 4: 544. On twigs of *Rubus occidentalis*.

FAMILY STILBEÆ.

Sporocybe parasitica (Peck) Sacc. Syll. Fung. 4: 605. [*Periconia parasitica*, Peck, Rep. N. Y. Mus. 33: 28.] On decayed branches of *Rubus strigosus*.

Graphium pruinosipes (Peck) Sacc. Syll. Fung. 4: 614. [*Stilbum pruinosipes*, Peck, Rep. N. Y. Mus. 33: 28.] On dead branches of *Rubus strigosus*.

Graphium gracile, Peck, Rep. N. Y. Mus. 34: 50. Sacc. Syll. Fung. 4: 616. On leaves of *Rubus strigosus*.

Isariopsis Grayiana, Ellis, Bull. Torr. Bot. Club, 1882: 98. Sacc. Syll. Fung. 4: 631. On old branches of *Rubus nigrobaccus*.

FAMILY TUBERCULARIEÆ.

Tubercularia decolorans, Peck, MSS. [*Tubercularia carpogena*, Peck, Rep. N. Y. Mus. 43: 31. Sacc. Syll. Fung. 10: 705. Not *Tubercularia carpogena*, Corda.] On ripe blackberries, discoloring the affected drupes, making them red, like itself, hence easily overlooked.

Tuberculina persicina (Ditm.) Sacc. Syll. Fung. 4: 653. Parasitic on Red Rust and other fungi (Uredineæ), found on the leaves of many different plants.

Hymenopsis nigra (Fr.) Sacc. Syll. Fung. 4: 746. On stems of dead plants in general.

Order Hymenomyceteæ

FAMILY TELEPHOREÆ.

Hypochnus Sambuci (Pers.) Fr. Sacc. Syll. Fung. 6: 656. On dry branches of Sambucus and Rubus.

FAMILY CLAVARIEÆ.

Typhula rubicola, B. and C. N. A. F. 304. Sacc. Syll. Fung. 6: 750. On dead Rubus canes.

Order Uredineæ

Phragmidium gracile (Farl.) Arthur, Ia. Ured. 161. Sacc. Syll. Fung. 7: 749. Peck, Rep. N. Y. Mus. 29: 50. [*Phragmidium incrassatum gracile*, Farlow, N. A. F. 282.] On leaves of *Rubus odoratus*.

Coleosporium Vernoniæ, B. and C. N. A. F. 569. Sacc. Syll. Fung. 7: 755. On leaves of *R. nigrobaccus* (?).

Chrysomyxa albida, Kuhn. Sacc. Syll. Fung. 7: 761. Tracy and Galloway, Jour. Myc. 4: 62. Stone & Smith Rept. Mass. Hatch Exp. Sta. 9: 74. [*Coleosporium Rubi*, Ell. and Holw. N. A. F. 1878. Sacc. Syll. Fung. 7: 759.] On leaves of *Rubus occidentalis* and *R. nigrobaccus* in America and of *R. fruticosus* in Europe.

Uredo speciosa (Peck) Sacc. Syll. Fung, 7: 860. [*Lecythia speciosa*, Peck, Bot. Gaz. 1878: 34.] On leaves of *Rubus deliciosus*.

Lecythea tripustulata, Peck. Rav. Fung. Am. 491. On *R. nigrobaccus*. Resembles *Chrysomyxa albida* in external appearance.

Order Discomyceteæ.

Family Pezizeæ.

Pezizella vulgaris (Fr.) Sacc. Syll. Fung. 8: 278. On dry branches of Rubus and other plants.

Pezicula rhabarbarina (Berk.) Tul. Sacc. Syll. Fung. 8: 311. On decaying branches of *R. nigrobaccus* and several European species.

Pyrenopeziza Rubi (Fr.) Rehm. Sacc. Syll. Fung. 8: 361. On dead branches of Rubus in Europe and America.

Pyrenopeziza lacerata (C. and P.) Sacc. Syll. Fung. 8: 361. [*Peziza lacerata*, C. and P. Grev. 1: 6.] On twigs of *Rubus odoratus*.

Lachnella rufo-olivacea (A. and S.). Sacc. Syll. Fung. 8: 398. [*Velutaria rufo-olivacea*, A. and S. Fuck. Symb. Myc. 300.] On dead but moist branches of Rubus.

Trichopeziza subochracea (C. and P.) Sacc. Syll. Fung. 8: 408. [*Peziza subochracea*, C. and P. Grev. 1: 6.] On stems of *Rubus odoratus*.

Dasyscypha bicolor (Bull.) Fuck. Sacc. Syll. Fung. 8: 439. On branches of Rubus and many other shrubs and trees.

Dasyscypha acutipila (Karst.) Sacc. Syll. Fung. 8: 447. On *Rubus parviflorus*, stems of grasses, etc.

Dasyscypha clandestina (Bull.) Fuck. Sacc. Syll. Fung. 8: 457. On fallen and decaying wood of Rubus and other shrubs and trees.

Dasyscypha scabro-villosa (Phill.) Sacc. Syll. Fung. 8: 458. [*Peziza scabro-villosa*, Phill. Grev. 7: 22.] On canes of *Rubus parviflorus*.

Family Dermateæ.

Tympanis conspersa, Fr. Sys. Myc. 2: 175. Sacc. Syll. Fung. 8: 578. On weak or dying branches of different trees and shrubs.

Family Bulgarieæ.

Orbilia vinosa (A. and S.) Karst. Sacc. Syll. Fung. 8: 622. On fallen and naked branches of Rubus and many other shrubs and trees.

Family Stictеæ.

Stictis Rubi, Schw. Syn. Am. Bor. 179. Sacc. Syll. Fung. 8: 694. On old canes of *Rubus nigrobaccus*.

Family Phacidieæ.

Coccomyces Rubi (Fr.) Karst. Sacc. Syll. Fung. 8: 751. [*Phacidium Rubi*, Fr. Syst. Myc. 2: 578.] On leaves of *Rubus parviflorus*.

Rhytisma Blakei, M. A. Curtis. Farlow and Seymour, Host. Ind. 37. On *Rubus hispidus*.

Family Patellarieæ.

Durella compressa (Pers.) Tul. Sacc. Syll. Fung. 8: 790.

CHAPTER XI

THE BOTANY OF THE BRAMBLES

In order that the student and the experimenter may gain a proper view and perspective of what has been done in the amelioration of the bramble fruits, and of what may be expected from further effort, a descriptive inventory is here made of all the species and marked natural varieties of the genus Rubus, which are either native to North America (north of Mexico) or are in cultivation here. A discussion of this subject from the view-point of the historian and plant-breeder, together with a revision of the blackberries and dewberries, is contained in Bailey's "Evolution of our Native Fruits."

RUBUS, LINN.—BRAMBLE

Calyx persistent, 5-parted, without bractlets; tube short and open. Petals 5, deciduous. Stamens numerous. Achenes usually numerous, with 2 collateral suspended ovules in each cell, one of which is abortive, becoming small drupes. Styles nearly terminal, stigma simple or obtuse. Receptacle spongy or succulent, convex, persistent or deciduous. Perennial herbs or somewhat woody, erect or trailing, often prickly, leaves simple or 3 – 5 foliolate, with stipules adnate to the petioles; flowers mostly white, reddish in a few species, solitary or in clusters; fruit usually edible, black, red or yellowish.

The genus is supposed to derive its name from the Latin word *ruber*, meaning red. Although represented by many species in

North America, it is much more abundant in the Old World, where the botany of the subject becomes exceedingly complex, owing to the endless variety and frequent intermixture of forms. The following list includes only species native to North America north of Mexico, and such European and Asiatic species as are known to be in cultivation in the United States.

A. Fruit somewhat hemispherical, concave beneath, parting from the receptacle when ripe; drupelets sometimes few in number, falling away separately (Raspberries).
  B. Leaves simple; flowers large; prickles none; fruit and receptacle flat and broad.
    C. Stems ascending, soft-woody. Nos. 1, 2, 3.
    CC. Stems above ground nearly or quite herbaceous; plants low and delicate. 4, 5, 6.
  BB. Leaves simple; flowers small; stems more or less prickly.
    C. Stems frutescent, low and trailing. 7.
    CC. Stems upright, shrubby. 8, 9.
  BBB. Leaves compound, of 3–5 pinnate or pedate leaflets.
    C. Stems annual, herbaceous; fruit usually of few grains.
      D. Unarmed. 10, 11, 12.
      DD. Armed with minute slender prickles. 13.
    CC. Stems biennial and woody, prickly; receptacle oblong.
      D. Fruit hemispherical; petals small, erect, white. 14, 15, 16, 17, 18, 19.
      DD. Fruit oblong; petals large, red. 20.
  BBBB. Leaves pinnate, evergreen; flowers double. 21.
AA. Fruit, or collective drupelets, adhering to the juicy prolonged receptacle, mostly ovate or oblong and black; flowers white.
  B. Stems upright; plant propagating by suckers. 22, 23, 24, 25, 26.
  BB. Stems trailing; plant propagating by tips. 27, 28, 29, 30, 31, 32, 33, 34, 35.

1. RUBUS ODORATUS, Linn.—Purple-flowering raspberry. Thimbleberry, Mulberry (erroneously).

Stem shrubby, erect, 3–5 feet (9–15 decimeters) high, branched; leaves large, cordate at base, 3–5 lobed, the middle one often prolonged, mucronately serrulate-toothed; stipules nearly free, deciduous, peduncles and calyx densely clothed with purplish, very clammy, glandular hairs, extending to upper parts of stem; peduncles many-flowered, compound; flowers very large, sepals tipped with a long appendage, as long as the

segment, and sometimes dilated; petals broadly obovate, purplish rose-color, longer than the sepals; fruit broad and flat, red, well-flavored. (Fig. 49.)

Original distribution. — Nova Scotia to Florida and west to Michigan.

A form with oblong-lanceolate leaf lobes, smaller and more compact inflorescence, and smaller fruit of a "more decided

Fig. 49. *Rubus odoratus* (×¼)

musky taste," was described from West Virginia by Millspaugh as var. *Columbianus*, in 1892. (Bull. 24, W. Va. Exp. Sta.)

For the position which this species holds in cultivation, see Chapter VI.

2. R. PARVIFLORUS, Nutt. — Rocky Mountain Thimbleberry. *R. Nutkanus*, Mocino. *R. Californicus*, O. Kuntze.

Stems erect or drooping, 3–8 feet (1–2.5 meters) high; bark green and smooth, or more or less glandular pubescent, becoming brown and shreddy; leaves palmately 5-lobed, lower lobes smaller or equal, cordate at base, unequally serrate, 4–12 inches

Fig. 50. *Rubus parviflorus* (×⅓)

(10–30 cm.) broad; the lobes acute or acuminate, glabrous or somewhat tomentose, the veins beneath, also the petioles and peduncles, usually more or less hispid with gland-tipped hairs, stipules lanceolate, acuminate; flowers commonly few, white, 1–2 inches (2.5–5 cm.) broad; calyx glandular pubescent or tomentose; sepals acute, terminating with a glandular linear cusp, about as long as the petals; carpels numerous, tomentose; fruit red, large, hemispherical, sweet and pleasant. (Fig. 50.)

Found in shaded places from Monterey to Alaska and eastward to New Mexico and Lake Superior.

In California it becomes more tomentose, especially on the under side of the leaves (var. velutinus [Hook & Arn.] Brewer).

This is practically a white-flowered *R. odoratus*, its general character being otherwise much the same. In Europe it has been sometimes mentioned in gardening journals as *R. odoratus* var. *alba*. It is an attractive shrub, well worthy of cultivation. Although found in severe climates, it has not proved hardy at the Arnold Arboretum.* It was there grown from seeds collected in a mild climate, which may have rendered the plants tender. This is called Salmon-berry in Gray's Botany of California, but that name appears to belong properly to *R. spectabilis* of the Pacific coast.

3. R. DELICIOSUS, James. *R. Neo Mexicanus*, Gray.

Stem woody, 3–4 feet (9–12 decimeters) high, branched, erect, smooth, or with bark loosened and shredded; petioles and young shoots red; leaves reniform-orbicular, slightly rugose, very minutely glandular, somewhat 3–5 lobed, unequally and oftener finely serrate, 1–2 inches (2.5–5 cm.) broad; peduncles, petioles and calyx slightly pubescent, but not glandular; stipules lanceolate, acuminate; peduncles mostly one-flowered; flowers white, 1–2 inches (2.5–5 cm.) broad; sepals oval or ovate-lanceolate, appendage linear or slightly dilated, shorter than the segments; petals obovate, nearly twice the length of the sepals; fruit purplish or dirty wine-colored, hemispherical, drupes large and soft, resembling a red raspberry (Fig. 51).

Original distribution.—Sources of the Missouri and cañons of the Colorado.

The fruit of this beautiful Rocky Mountain species was originally described as "delicious," but later observers do not concur in the opinion. The seeds are large, covered with only a thin pulp, and the flavor is insipid. It was originally discovered by Professor James, in 1822, and has long been known in England, where it appears to be appreciated. Excellent figures have appeared in English horticultural and botanical journals. Gardeners there report success in propagating it by seeds, root-cuttings and stem-cuttings. It has been thoroughly tested at the Arnold Arboretum and found perfectly hardly, although it seldom bears fruit. It does not throw up suckers from the root, and is difficult

*Garden and Forest, 1:261.

to propagate ; seeds or stem cuttings are recommended as the most satisfactory means, although the latter do not take root readily.* On the Plains it suffers from the summer sun and drying winds.

4. R. CHAMÆMORUS, Linn.—Cloud-berry. Baked-apple Berry.

Low, monœcious, or sometimes dicœcious; stem simple, herbaceous, arising from a frutescent, creeping or subterranean one, 2–3-leaved, 1-flowered ; leaves roundish reniform, somewhat 5-lobed, lobes rounded or obtuse, irregularly serrate, wrinkled; calyx pubescent ; sepals oval, obtuse, with a very slight point; petals obovate, white, longer than the sepals ; fruit of few grains, amber-colored (Fig. 52).

Widely distributed throughout the arctic regions of both hemispheres. It occurs in the Atlantic and Rocky Mountain alpine regions, but not in the Pacific alpine regions.

This species is interesting and widely known. In England it is popularly known as "Averon" or "Mountain Bramble," and in Scandinavia as "Grapes of the North." The male and female flowers are borne on separate stems, which are usually, though not always, connected at or beneath the ground with a trailing stem or rootstock. In Northern Denmark and Sweden its fruit is important, large quantities being gathered and sold in the markets. In Scotland it is found on the Grampian Hills, and it was the badge of the MacFarlane clan. Prize essays concerning it have appeared in the transactions of the Highland society. Attempts have been made to cultivate it in Europe, but with poor success.

5. R. LASIOCOCCUS, Gray.

"Between *R. pedatus* and *R. Chamæmorus*. Stems herbaceous, dwarf, ashy-puberulent; stipules ovate, subscarious; leaves roundcordate, 3–5-lobed, the lobes slightly trisected, lobes and segments very obtuse, somewhat doubly dentate; peduncles branching, short, few leaved, bearing 1–2 terminal flowers; calyx segments ovate, acuminate, entire; petals obovate, white, shorter than the sepals; ovaries few (5–9), drupelets fleshy and tomentose."—Gray, Proc. Amer. Acad. 17: (1882) 201.

Described from Oregon, near Mt. Hood.

Resembles *R. pedatus*, but is less slender, with thicker leaves, which are seldom divided, flowers little larger, petals broader.

* Garden and Forest, 1: 225-3: 336.

Fig. 51. *Rubus deliciosus* (×⅔).

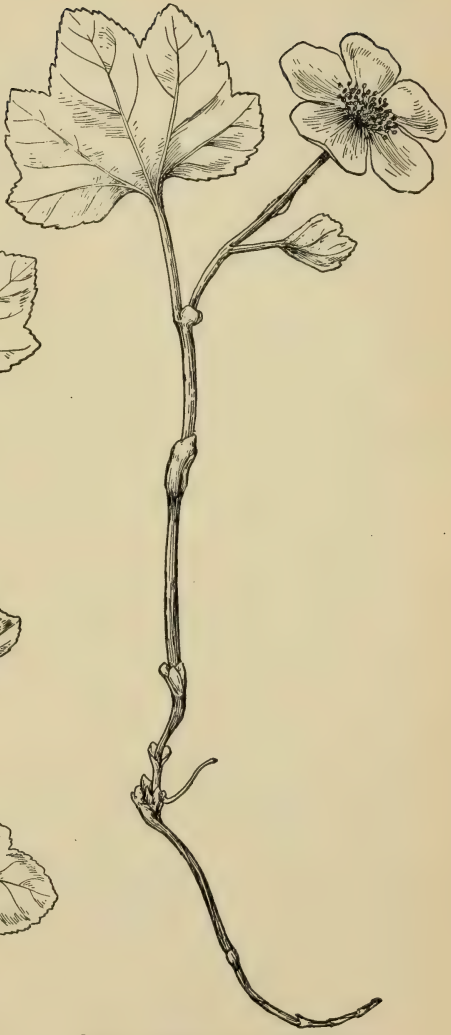

Fig 52. *Rubus Chamæmorus* (×1).

The canescent, dense tomentum of the ovaries is seen, even on the mature drupelets.

6. R. STELLATUS, Smith.

Stem herbaceous, simple, 1-flowered, leaves cordate, rugose, deeply 3-lobed or 3-parted, often compound, serrate; stipules ovate, acute or obtuse; peduncles short; segments of the calyx linear-lanceolate or linear, sometimes slightly spatulate; petals oblong, erect.

Distribution.—Behring region, Wrangel Land, Aleutian Islands.

7. R. NIVALIS, Dougl.

Low, not more than 6 inches (1.5 decimeters) high, from a long, trailing, frutescent stem; spines rather stout, recurved; leaves cordate, 3-lobed, very rarely almost compound, very sharply toothed, glabrous, the petioles and veins armed with recurved prickles, stipules ovate, acute, prominent, often toothed; peduncles short, 1- or 2-flowered; calyx lobes lanceolate, pubescent; petals small, lanceolate, very acute; fruit red, sour; seeds few, large and wrinkled.

Distribution.—In the Bitter Root Mountains and northward on high ridges of the Rocky Mountain system; also, in the Cascade Mountains.

This bears some resemblance to *R. vitifolius*, but may be distinguished from that species by the simple leaves, sharp petals, lack of pubescence, and especially by the simple inflorescence. Professor Piper writes that "In deep woods it never fruits, but on open, rocky places bears an abundance of sour red berries. The plant is prostrate, like *R. vitifolius*."

8. R. CRATÆGIFOLIUS, Bunge. Chinese Raspberry.

Stems shrubby, upright or drooping, 3-6 feet (1–2 meters) high, armed with few straight prickles; leaves glabrate, cordate, ovate, acute, 3–5 lobed, lower one smallest, middle lobe long, acuminate, often narrower at base, lateral lobes oblique, all doubly serrate, petioles and veins beneath armed with scattering, minute, recurved prickles; stipules linear, scarious, leafy shoots terminating in a several-flowered, cymose cluster; flowers white, nearly half an inch broad, inconspicuous; calyx slightly pubescent, lobes triangular, acuminate, bearing glandular tipped hairs along the margin; petals small; fruit orange-scarlet, nearly hemispherical (Fig. 53).

Original distribution.—Manchuria, Northern China and Japan.

A further account of this species appears in Chapter VI

Fig. 53.
Rubus cratægifolius (×⅔).

9. R. MICROPHYLLUS, Linn. f. *R. palmatus*, Thunb. Mayberry.

Spreading bush, 4 or 5 feet (12–15 decimeters) high, with short stout prickles; leaves small, dark green above, somewhat lighter beneath, silky pubescent on the veins beneath, 3–5-cleft, the lobes very narrow, acuminate, doubly and sharply serrate, central lobe much longer than the lateral ones; flowers three fourths of an inch (20 mm.) broad; sepals narrow, acuminate; petals broadly ovate; fruit small, of little value.

Japan.—Said by Luther Burbank to have entered into hybrids which he considers valuable; but otherwise unknown in this country. The fruit is occasionally eaten by the Japanese.

10. R. ARCTICUS, Linn.

Stem low, herbaceous, sometimes dicœcious, slightly pubescent, mostly erect, 1–2-flowered; leaves trifoliolate; leaflets rhombic-ovate or obovate, coarsely and often doubly serrate, slightly petiolate; flowers rose-colored, ½–1 inch (12–25 mm.) broad; calyx slightly pubescent, sepals lanceolate, sometimes slightly dilated at the tip, nearly as long as the petals; petals obovate to oblanceolate; fruit amber-colored, pleasant (Fig. 54).

VAR. GRANDIFLORUS, Ledeb. Stem shorter, leaflets more rounded, lateral ones sessile; petals larger, obovate, oblong; sepals narrower, often much elongated.

Fig. 54.
Rubus arcticus (× 1).

Distribution.—Northern countries of the three continents. In America it occurs in the Rocky Mountain and Pacific, but not in the Atlantic alpine region.

This pretty little plant was a favorite of Linnæus, who called it a "beneficent plant," and said that he would indeed be "ungrateful did he not give a full description of it, since the vinous nectar of its berries frequently recruited his spirits when almost prostrate with hunger and fatigue."

11. R. PEDATUS, Smith.

Stems slender, pubescent, creeping or filiform; leaves smooth or sparingly villous; leaflets cuneate-obovate, not exceeding an

Fig. 55. *Rubus pedatus* (×½).

inch in length, incisely toothed, the lateral ones often parted to the base; stipules ovate-oblong, scarious, persistent; peduncles long and slender, bearing two bracts which are sometimes midway between base and tip; mostly 1-flowered; flowers white ½–¾ inch (12–20 mm.) broad: sepals ovate-lanceolate, entire or incised, about as long as the petals, at length reflexed; petals sessile, narrowly obovate; fruit consisting of 3–6 large red, pulpy drupelets (Fig. 55).

Pacific coast from San Francisco to Alaska, and in the Rocky Mountains between latitude 52° and 56°.

The fruit of this plant lacks the protuberant receptacle common to other species of Rubus, thus approaching the genus Dalibarda.

12. R. AMERICANUS (Pers.), Britton.—Dwarf Raspberry. *R. triflorus*, Richardson.

Stems ascending, 6–12 inches (1.5–3 decimeters) high, or trailing, suffruticose at base, smooth or minutely pubescent, sterile ones sometimes rooting at the tips; leaves 3-(rarely pedately 5) foliolate, on long slender petioles; leaflets thin, glabrate, or pubescent beneath, rhombic ovate or ovate-lanceolate, acute at both ends, often acuminate, coarsely and somewhat doubly serrate; the terminal one petiolate; stipules ovate or oblong, entire; peduncles mostly terminal, 1–3 flowered; pedicels and base of calyx bearing glandular tipped hairs; sepals ovate-lanceolate, acuminate, tomentose toward the tips, at length reflexed; fruit small, red (Fig. 56).

Labrador to New Jersey, and west to Colorado.

This is a pretty little plant of eastern woods.

13. R. SAXATILIS, Linn.

Stems pubescent, sparsely beset with minute prickles; sterile shoots, long, slender, creeping, terete, often rooting at the tip in autumn; flowering stems erect, mostly simple, 4–12 inches (1–3 decimeters) high; leaves 3-foliolate, on long petioles, both sides green and slightly pubescent; leaflets ovate or rhombic-ovate, obtuse at both ends or acute at the apex, coarsely dentate, middle one long, lateral ones short-petiolate; stipules of flowering stems ovate, of sterile ones linear; inflorescence cymose, 3–10 flowered, peduncles terminal and axillary; pedicels prickly; calyx pubescent, especially within, but not glandular; sepals ovate or lanceolate, acuminate, commonly no longer than the petals, at length reflexed; petals small, erect, spatulate, white; fruit of 1–6 large grains, not coherent, deep red; seeds large, slightly wrinkled.

Found in Greenland, and widely distributed in Europe, but apparently does not occur on the American continent proper.

A French work entitled *Traité des Plantes Fourragères* mentions this as a good forage plant, either fresh or dry.

14. R. IDÆUS, Linn. European Raspberry.

Plant usually stiff, erect, and light colored, the main stems bearing nearly straight, slender prickles; flowering shoots, petioles, veins, pedicels and calyx finely pubescent, but not glandular, and sparsely beset with firm, recurved prickles; leaves of bearing wood 3-foliolate, of new canes mostly 5-foliolate, thicker than in *R. strigosus*, whitened-downy beneath, and usually somewhat wrinkled; middle leaflet ovate, petiolate; lateral ones ovate-lanceolate, sessile, cut-serrate; inflorescence sub-corymbose; pedi-

Fig. 56. *Rubus Americanus* ($\times\frac{3}{4}$).

Fig. 57. *Rubus Idæus* (×½).

cels short, ascending, aggregated above; calyx tomentose; sepals ovate-lanceolate, acuminate, longer than the petals, at length recurved; fruit dark red or yellow, produced more or less continuously throughout the season (Fig. 57).

Original distribution.—Common throughout Europe and western Asia.

This is the parent of the older garden varieties which were imported from Europe, and which ushered in raspberry growing in

America. For a discussion of the characteristics of the species from the standpoint of the fruit-grower, see Chapter VII.

15. R. STRIGOSUS, Michx. American Red Raspberry.

Stems more slender and flexible than in *Rubus Idæus*, usually brown or reddish brown, somewhat glaucous; beset with stiff,

Fig. 58. *Rubus strigosus* (×⅓).

straight prickles; flowering shoots, pedicels, calyx and petioles hirsute, with glandular-tipped hairs in the wild type, though largely disappearing in cultivation; leaves of bearing canes 3-foliolate, of young canes mostly 5-foliolate; middle leaflet ovate, petiolate, lateral ones ovate-lanceolate, sessile, cut-serrate; inflorescence racemose, peduncles usually scattered, mostly slender and drooping; calyx slightly pubescent or hirsute; fruit light red, produced less continuously than in *Rubus Idæus* (Fig. 58).

Original distribution.—North Carolina to New Mexico and far northward. Northeastern Asia, Japan to Altai and the Himalayas.

This species is closely related to *R. Idæus*, though wild forms can be readily separated by botanical characters. In cultivation these characters largely disappear. For the position of the species in the pomological world, see Chapter VII.

A white variety of *R. strigosus* occurs rarely, and plants of it, received from A. S. Fuller, are growing in the Cornell University gardens. The form is also represented in cultivation by the variety known as Meredith Queen. The fruit is small, soft, amber-white, with prominent grooved drupes.

16. RUBUS NEGLECTUS, Peck. Purple-cane Raspberry.

Habit various, but with the stem typically long and rooting at the tip, glaucous, more or less armed with prickles; leaves of bearing canes 3-foliolate, of young canes 3–5-foliolate, coarsely and irregularly serrate, middle leaflet petiolate, lateral ones sessile; inflorescence racemose-cymose; peduncles mostly erect, armed with firm, mostly recurved prickles, and in wild forms more or less hirsute with glandular hairs when young, lower ones mostly unequally branched; blooms usually somewhat aggregated at the tip, sepals ovate, acuminate, scarcely longer than the petals; fruit varying from dull purple to dark red, or even yellowish.

Original distribution.—Probably quite generally distributed with the two species which it connects.

To this form belong the Purple-cane raspberries of cultivation. By many the form is thought to be of hybrid origin, while others regard it as a distinct species. From specimens before me I have been able to arrange a series from wild plants and another from cultivated forms, each representing an almost perfect gradation from *R. strigosus* to *R. occidentalis*, and I am led to believe that all are of hybrid origin. A further discussion of the group, as found in cultivation, will be found in Chapter VII.

R. STRIGOSUS × OCCIDENTALIS var. LEUCODERMIS.

Flowering shoots, petioles, pedicels, and calyx hirsute, with glandular tipped hairs, also beset with long, slender, straight or recurved prickles; leaves of bearing canes 3-foliolate, middle leaflet petiolate, lateral ones sessile, mostly ovate, sharply cut-serrate; inflorescence racemose, somewhat aggregated; calyx somewhat pubescent and hirsute, reddish purple within, as are also the base of the styles.

This form holds the same position between the western representatives of the red and black raspberry that *R. neglectus* does between the eastern ones. It was found growing with *R. occidentalis* var. *leucodermis* and *R. strigosus* at Sicamous, B. C., in 1889, by Professor J. M. Macoun, who writes that it very much resembles *R. neglectus*, the fruit being abundant, purplish in color, lacking in firmness, but pleasant.

17. R. OCCIDENTALIS, L. Black Raspberry, Thimbleberry.

Canes long, recurved, at length rooting at the tips, conspicuously glaucous, armed with strong recurved prickles; leaflets 3, both on bearing canes and young shoots (rarely 5 on the latter), ovate, pointed, coarsely and doubly serrate, whitened-downy beneath, the lateral ones mostly somewhat stalked; inflorescence cymose; peduncles mostly aggregated in a close cluster at the tip, short, stiff, erect, bearing stiff recurved prickles, rarely with straight bristles also; petals shorter than the sepals; fruit depressed, firm and dense, black, rarely yellow.

Original distribution.—Mountains of Georgia westward to Missouri and the sources of the Oregon. and far northward into British America.

This is to-day the most important raspberry of cultivation.

Var. LEUCODERMIS (Dougl.).—*R. leucodermis*, Dougl.

Leaflets coarsely dentate-serrate, often approaching incised-serrate; prickles strong and more hooked; fruit reddish black, with a gray bloom (Fig. 59).

Found in the mountains of Arizona, California, Oregon, Washington and northern Utah.

This has long stood as a distinct species, but forms of *R. occidentalis* occur which show the same coarse serration of leaves, and there is an eastern yellow-fruited form which has as strong and prominently hooked prickles. Professor Piper writes: "I agree with Focke in considering this merely a variety of *R. occidentalis*. I have never seen it with 'yellow' fruit, as described in Botany of California. The fruit is dark wine-red, nearly black, and of excellent flavor."

18. R. HESPERIUS, Piper.

"Habit of *R. leucodermis;* 1–2 meters high; young stems glaucous, older ones brownish and shining, densely beset with strong prickles, which are straight on the larger branches

Fig. 59. *Rubus occidentalis* var. *leucodermis* (×⅔).

but more or less recurved on the smaller ones; leaves trifoliolate, or on young, vigorous shoots pedately 5-foliolate; leaflets 5–8 cm. long, ovate, acuminate, thickish, coarsely and doubly serrate, perfectly green and glabrous on both sides, not shiny, armed on the midrib beneath, and even on the lateral veins, with recurved or straight prickles; lateral leaflets on very short, 1–2 mm. long petioles; terminal leaflet sometimes 3-lobed; petioles stout, usually glaucous, 2–5 cm. long, armed with stout recurved prickles; stipules setaceous, about 8 mm. long; flowers in terminal corymbs, or a few in the axils of the upper leaves, these solitary or in clusters of two or three; peduncles and pedicels stout and more densely armed than the branchlets; sepals in fruit green, glabrous, deltoid-lanceolate, long-acuminate, 12 mm. long; petals and stamens not seen; fruit nearly black, without bloom, dry and rather tasteless; young carpels neither glaucous nor tomentose; seeds large.

"Closely related to *R. leucodermis*, Dougl., and *R. occidentalis*, Linn., from both of which it is readily distinguished by the entire absence of pubescence on the under side of the leaves. It is also much more strongly and densely armed than either.

"The plant occurs sparingly in Snake River cañon, and Wawawai and Almota, Whitman county, Washington. It grows usually along stream banks, but occasionally in crevices of moist cliffs."—*Piper*.

19. R. PHŒNICOLASIUS, Maximowicz. Japanese Wineberry, Japanese Raspberry. *R. occidentalis*, Thunb.

Stems 3–5 feet (9–15 decimeters) high, densely hirsute with reddish, glandular-tipped hairs, and occasional long straight prickles, which become recurved on the petioles and veins beneath the leaves; leaflets 3, broadly ovate, acuminate, incised-serrate, whitened-downy beneath, the middle one often somewhat 3-lobed, petiolate, and much the larger, the lateral ones sessile; inflorescence paniculate, pedicels short, erect, calyx very hairy, closely clasping the fruit till nearly mature, when it becomes horizontally withdrawn; sepals lanceolate, awl-pointed, stamens withdrawing with the calyx; petals minute, obovate; fruit small, red, acrid, drupes small, weakly coherent; seeds small, smooth, easily crushed.

Original distribution.—Upon the Islands of Yezo and Nipon, in Japan.

The species was described in 1872, and in 1880 was figured in the Botanical Magazine* from plants grown at Kew. Frequent

*t. 6479.

mention of it is found in both English and American horticultural journals since that date. For a discussion of its horticultural qualities, see Chapter VI.

20. R. SPECTABILIS, Pursh.—Salmonberry.

Stems rather robust, 5–10 feet (15–30 decimeters) high, sparingly armed with straight or ascending prickles; leaves 3-foliolate, or occasionally simple, thin, glabrate beneath; leaflets petiolate, ovate, acute or acuminate, doubly incised-serrate, and often 2–3-lobed, the veins beneath, also the petioles and peduncles sparingly villous-pubescent; stipules linear; flowers solitary or in pairs, red or purple, large and showy; sepals broadly ovate, acute, or with a short acumination, much shorter than the petals; fruit large, sub-conical, red or yellow; styles long, persistent (Fig. 60).

Original distribution.—The Pacific coast from California northward to Alaska.

Professor C. V. Piper, of the Washington Agricultural College, writes: "This is the 'Salmonberry,' and not *R. parviflorus*, as per Botany of California. There are two varieties, one with salmon-colored berries, whence the name; the other with dark wine-red berries. The former are better flavored, the latter having a bitter aftertaste. Both occur growing together, and are not to be distinguished save by the color of the fruit. The plant is confined to swamps and stream banks."

A more or less densely tomentose and silky form is also recorded—Var. Menziesii (Hook), Watson.

This plant was introduced in England in 1827, and has been frequently referred to in the horticultural journals of that country. According to the Journal of Botany* it has become naturalized in Kent, where it is locally known as "Woodman's Rose." For further mention of it, see Chapter VI.

21. R. ROSÆFOLIUS, Smith.—Rose-leaved Raspberry. "Strawberry-Raspberry." *R. sorbifolius*, Maxim. (See Fig. 28, p. 149.)

A low plant 1–2 feet (3–6 decimeters) high, forming dense clumps from the numerous suckers produced; stems and branches covered with recurved prickles; leaves evergreen in its native habitat, pinnate, leaflets 5–7, or 3 at the ends of the flowering shoots, sessile or the end one petiolate, lanceolate, acuminate, sharply and doubly serrate, the under side green, with scarcely

*Vol. 19, p. 251.

Fig. 60. *Rubus spectabilis* (×¾).

visible soft glandular hairs or dots; flowers 1–3 in terminal clusters, double in the cultivated form, white, rose-like, 1–2 inches (25–50 mm.) broad, borne in succession; fruit of the wild form red or yellow, about an inch in diameter, made up of many small carpels.

Original distribution.—Japan, China and the East Indies.

For an account of *R. rosæfolius* in cultivation, the reader is referred to Chapter VI.

22. R. NIGROBACCUS, Bailey. *R. villosus*, authors, not Ait. Common or High Blackberry. Long Blackberry.*

Stems shrubby, 1–8 feet (3–25 decimeters) high, furrowed or terete, upright or reclining, armed with stout curved prickles; young branches, peduncles, stipules, petioles and veins beneath the leaves pubescent, and bearing numerous glandular tipped hairs; leaflets mostly 3 on fruiting canes, 5 on young canes, ovate or oblong, pointed, unequally and sharply serrate, the terminal one petiolate, the lateral ones sessile or short petiolate; inflorescence racemose, elongated, nearly or quite leafless; flowers numerous, conspicuous; bracts short; sepals glandular, ovate, with a long, linear point, which is often dilated; petals obovate-oblong, longer than the sepals; fruit narrow, varying from nearly globular to long-oblong, dull color, sweet; drupelets small, closely packed.

Original distribution.—Common throughout the eastern portion of the United States and far northward in British America.

Var. SATIVUS, Bailey.

Clusters fewer flowered; pedicels oblique; fruit short and thick, glossy black, sour until very ripe; drupelets fewer, large, soft, loosely and irregularly placed.

Found in dry, open places. The type most common in cultivation, as represented by Snyder, Kittatinny and Agawam.

Var. ALBINUS, Bailey. White Blackberry.

Canes terete, yellowish green; leaflets mostly 3, even on young canes; fruit pinkish cream or amber colored, sweet. Other characters closely resembling the specific type.

Sparingly found wild, associated with the species. Though introduced into cultivation at times, it has never proved valuable.

R. NIGROBACCUS × VILLOSUS. Blackberry-Dewberry hybrid.

Stems decumbent or ascending, rarely rooting at the tip, terete, sparingly armed with short, straight prickles; peduncles and petioles pubescent but rarely glandular. Leaflets usually 3, both on young and fruiting canes, simple in the flower cluster, oval, acuminate, very deeply, sharply and irregularly incised, the lateral ones sessile; inflorescence cymose, 4–8 flowered, interspersed with numerous simple, broadly oval or ovate leaves; sepals ovate, acuminate, rarely expanded at the tip, slightly tomentose within and on the margin; petals longer than the sepals; fruits globular or slightly oblong, good, bright black; drupelets large and prominent.

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*The nomenclature of the blackberries and dewberries is taken from Bailey's monograph in "Evolution of our Native Fruits."

Fig. 61. Snyder.—*Rubus nigrobaccus* var. *sativus*.

More or less commonly associated with the two parent species, at least in New York and Pennsylvania.

At first sight this type appears like a variety of *R. nigrobaccus*, but it is apparently found only where both *R. nigrobaccus* and *R. villosus* are growing. This, with its habit of occasionally rooting at the tips, and the fact that various gradations between the two species often occur, seems to be convincing proof of its hybrid origin. The type occupies the same ground between the blackberry and dewberry that *R. neglectus* does between the black and red raspberry. In cultivation it is represented by the Wilson, Wilson Jr., Thompson Early Mammoth, and others. This plant was in cultivation in Europe early in the century, and was called *Rubus heterophyllus* by Willdenow.

Forms of *Rubus setosus* often look as if they might be hybrids of *R. nigrobaccus* and *R. strigosus*. One of these forms, growing in a dryish tamarack bog at Lansing, Mich., was once thought by Professor Bailey and others to be such a hybrid. It is as follows:

Stems upright, 2–3 feet (6–9 decimeters) high, terete, sparingly armed with long, slender, straight or slightly reflexed prickles; peduncles and petioles very slightly pubescent; leaflets of bearing shoots 3, all sessile, of young shoots mostly 5, the three upper ones petiolate, broadly oval or obovate, acute or obtuse, sharply and irregularly serrate; inflorescence cymose, few-flowered, leafy, sepals small, ovate, acute, slightly tomentose at the margins, and bearing few minute glandular hairs; petals obovate, twice as long as the sepals; fruit globular oblong, of few grains, adhering to the receptacle.

23. R. ALLEGHENIENSIS, Porter. *R. villosus* var. *montanus*, Porter. *R. montanus*, Porter.

Similar to *R. nigrobaccus*, plant smaller and more slender, somewhat less prickly, branches commonly reddish, the younger parts very glandular; leaves and inflorescence like nigrobaccus; fruit rather dry, with a somewhat spicy flavor, small, long, thimble-shaped, narrowing toward the tip; drupelets small and numerous.

Found upon the mountains and higher lands of New York, New Jersey, Pennsylvania and North Carolina.

24. R. ARGUTUS, Link. *R. frondosus*, Bigel. *R. villosus* var. *frondosus*, Torr.

Plant lower and more bushy than *R. nigrobaccus*, younger parts pubescent, but sometimes scarcely at all glandular; leaves thicker, rather more numerous and persisting longer in the fall; leaflets coarsely, sharply and irregularly serrate, both on young and fruiting canes; inflorescence shorter, more corymbose, the lower pedicels subtended by leaves which are mostly simple and smaller toward the tip, giving the cluster a leafy or frondose appearance; flowers smaller; sepals broader, less attenuate; petals roundish.

Original distribution.—Occurs with the type, and northward.

Represented in cultivation by the Early Harvest and by the Dorchester, which was the first blackberry ever introduced.

Var. FLORIDUS, Bailey. *R. floridus*, Tratt.

A form with very large flowers in very short clusters, and leaves on the flowering shoots short, broad and nearly or quite obtuse. New Jersey to Alabama. Probably not in cultivation.

Var. RANDII, Bailey.

"Low and diffuse, 1°-2½° (3–8 decimeters) high, the canes bearing very few and weak prickles, or often entirely unarmed, very slender and soft, sometimes appearing as if nearly herbaceous; leaves very thin and nearly, or quite smooth beneath and on the petioles, the teeth rather coarse and unequal; cluster stout, with one or two simple leaves in its base, not villous, and very slightly if at all pubescent; flowers half or less the size of those of *R. nigrobaccus;* fruit small, dry and seedy."

Original distribution.—Woods, Mt. Desert, Me., New Brunswick and Lake Superior.

25. R. CANADENSIS, L. Thornless or Mountain Blackberry. *R. Millspaughii,* Britton.

Stems upright, 3–10 feet (1–3 meters) high, more or less deeply grooved, reddish brown, perfectly smooth and unarmed, except for a few weak prickles toward the top and on the smaller branches, petioles and mid-veins; branches and petioles of the young canes glabrous, those of the flowering canes, together with the pedicels, pubescent, but not glandular; leaflets of young canes 5, the three uppermost with long and slender leaf-stalks, glabrous above and beneath, narrowly ovate, mostly rounded at base, long-acuminate, leaflets of bearing canes 3, glabrate, often broader, more deeply and coarsely serrate and less acuminate; stipules of young canes very long and slender, scarious; inflorescence racemose, pedicels oblique, the lower ones axillary, the upper subtended by foliaceous bracts, ¼ inch or more in length; sepals broadly ovate, whitened-downy within, acumination short; fruit ripening late, roundish, jet black, with large and prominent drupelets and a rather hard core, sour and sometimes even bitterish, at least until very ripe.

Found in mountainous parts of the Atlantic states, but confined chiefly to high elevations, especially southward. Usually abundant wherever it occurs.

The species often crosses with *R. nigrobaccus,* forming various gradations, where the two meet on the mountain sides.

26. R. CUNEIFOLIUS, Pursh. Sand Blackberry.

Shrubby, 1–3 feet (3–9 decimeters) high, upright, armed with numerous stout, recurved prickles; branchlets and lower side of the leaves whitish woolly, partially disappearing with age; leaflets 3 on the bearing canes, 5 on the young ones, obovate-cuneate, acute or obtuse, thickish, entire at base, serrate toward the apex, often coarsely so on fruiting canes; inflorescence cymose, peduncles few-flowered; sepals oblong, mucronate, woolly within and without; petals large, narrowly obovate; fruit roundish, of excellent quality (Fig. 62).

Distribution.—Sandy woods from southern New York and Pennsylvania, south to Florida, and west to Louisiana and Missouri. This is represented in cultivation by the "Topsy," or "Child's Tree Blackberry."

Fig. 62. *Rubus cuneifolius*(×1).

The Kew Index also recognizes a European species under the name *R. cuneifolius* Merc., but it was published since *R. cuneifolius*, Pursh., therefore cannot stand. In fact, the European name has already been replaced by *R. sphenoides*, Focke.

27. R. VILLOSUS, Ait.—Low Blackberry. Dewberry. *R. Canadensis*, authors, not L.

Main stems shrubby, long, trailing, rather sparsely and lightly prickly; leaflets 3, on both fruiting and young canes (rarely pedately 5–7); oval or ovate-lanceolate, acuminate, or obtuse at base of fruiting shoots, thin, slightly roughened, sharply and usually singly cut-serrate, petioles and veins beneath often prickly; inflorescence cymose, scarcely extending beyond the leaves, few-flowered; peduncles slightly pubescent but not glandular; sepals tomentose within, often 3-lobed at tip, the central lobe being long, expanded and leaflike.

Distribution.—Newfoundland to Virginia, and west to eastern Kansas and central Minnesota.

This species, with its varieties, forms the foundation type to which the northern dewberries belong.

Var. RORIBACCUS, Bailey.

"Plants larger and stronger; leaflets broad below, usually triangular-ovate, doubly serrate with small teeth, and more or less notched or jagged; peduncles longer, straighter, stouter, and more erect, habitually more numerous and more conspicuously overtopping the leaves; flowers very large, sometimes two inches (5 cm.) across; sepals uniformly larger, some of them much prolonged and leaf-like and conspicuously lobed (sometimes becoming an inch long and wide); fruit much larger and longer as a rule."—*Original description.*

This variety is represented in cultivation by the Lucretia. It was found in West Virginia, though evidently not common there.

Var. MICHIGANENSIS, Card.

Stems woody, trailing in sand and more or less subterranean, sparingly armed with comparatively weak, reflexed or recurved prickles, which become stronger on the petioles of the present year's growth; upright shoots or peduncles nearly herbaceous, more pubescent, with but few slender prickles and with a greater diameter than in the species; stipules long, prominent, often 1 inch (25 mm.) long on young wood, with a distinct midrib; leaflets of flowering shoots 3, mostly ascending, giving the shoots a leafy appearance; leaflets of new wood pedately 5–7, larger than in the species, more deeply and irregularly incised, somewhat pubescent above and beneath; pedicels numerous, pubescent, but not glandular, upper one short, scarcely exceeding the leaves; flowers small, sepals densely tomentose within, reflexed, with a slightly expanded acumination; petals small, obovate, about as long as the sepals; fruit large and good.

Collected by L. H. Bailey, near South Haven, Michigan.

This resembles var. roribaccus, but appears to be more strictly trailing, less woody, more pubescent, leaflets more incised and not so broad at base, pedicels not so long and straight, prickles fewer and more slender, stipules longer and flowers much smaller.

28. R. INVISUS, Bailey.—*R. Canadensis* var. *invisus*, Bailey.

Stems stout and stiff, often partially ascending, sparingly armed with reflexed straight prickles; leaflets much larger than in the species, broad and thin, glabrate above and beneath, the teeth usually very large, often rounded and terminating in a minute point; peduncles or flower stems long and straight, glandular in the wild type; young flower buds commonly bearing a prominent tip formed by the connivent ends of the sepals, which often become foliaceous later; flowers generally larger than in the species and overtopping the leaves; fruit globular-oblong, of good size.

Found wild at Ithaca, N. Y.; probably widely distributed.

Represented in cultivation by Bartel, Gen. Grant and Neverfail.

29. R. ENSLENII, Tratt.—*R. Baileyanus*, Britton. *R. villosus* var. *humifusus*, Torr. & Gray.

"Procumbent or ascending, pubescent or nearly glabrous, the stem slender, sparingly prickly, the upper leaves almost invariably unifoliolate, and the racemes but 1-few-flowered. The leaflets are broadly ovate or oval, acute or more commonly obtuse, thin, the terminal ones usually cordate, or all of them rounded or obtuse at the base; fruit small. The plant appears to be always a dry wood species."

30. R. TRIVIALIS, Michx. Low Bush Blackberry, Southern Dewberry.

Stems shrubby, procumbent, terete, beset with strongly recurved or reflexed prickles, glaucous or hirsute with glandular tipped hairs and bristles; leaves evergreen, coriaceous, glabrate, mostly 3-foliolate on bearing canes, 3–5-foliolate on young canes; leaflets ovate-oblong or lanceolate, sharply serrate; veins, petioles and peduncles bearing numerous stout, recurved or reflexed prickles; inflorescence cymose, 1–4-flowered; sepals ovate, acuminate or mucronate, slightly pubescent, but not prickly; petals obovate, twice as long as the sepals; fruit oblong, black, good. (Fig. 63.)

Original distribution.—Sandy soil, Virginia to Florida, and west to Texas and Missouri.

This is the common dewberry of the southern states. It is represented in cultivation by the Manatee and Wilson's White.

31. R. VITIFOLIUS, Cham & Schlecht. Pacific Coast Dewberry or Blackberry. *R. ursinus*, Cham & Schlecht. *R. macropetalus*, Dougl.

Hermaphrodite plant.—Stems becoming woody, weak or trailing, 5–20 feet (1.5–6 meters) long, terete, glaucous; fruiting branches numerous, armed with straight, rather slender prickles, mostly pubescent; leaves 3-foliolate, rarely 5-foliolate on young canes, often simple and 3-lobed on flowering branchlets; leaflets ovate to oblong, coarsely toothed, smooth or somewhat tomentose; veins, petioles, peduncles, and often the calyx, aculeate, with slender prickles; stipules oblanceolate to linear, sometimes long and toothed; sepals ovate or ovate-lanceolate, acuminate, sometimes foliaceously tipped, then exceeding the petals; fruit oblong, black, sweet (Fig. 64).

Pistillate plant.—Leaves all 3-foliolate, narrower, more sharply serrate, thinner and less pubescent, flowers smaller.

Fig. 63. *Rubus trivialis* ($\times\frac{3}{8}$).

Fig. 64. ***Rubus vitifolius.***—Skagit Chief dewberry (×¾).

Original distribution.—The coast ranges of California, Oregon and Washington, the valley of the Willamette, and also in Idaho.

This is an exceedingly variable species. Different specimens of it were originally described on adjoining pages by the same authors as two species under the names *R. vitifolius* and *R. ursinus.* Later the pistillate form was described by Douglas as *R. macropetalus.* Some forms are hermaphrodite, others stami-

nate, with abortive pistils, and still others pistillate, with only rudimentary stamens. Some forms are wholly trailing, while others have strong and nearly upright stems. The staminate

Fig. 65. *Rubus hispidus* (×½).

forms are said to be the stouter. The Aughinbaugh and others belong here. Professor Piper writes that it is "abundant in western Washington, especially in old 'burns,' and fine flavored berries

are gathered each year in great quantities. It is locally called blackberry, although it is really a dewberry."

32. R. HISPIDUS, L.—Running Swamp Blackberry.

Stems slender, scarcely woody, long and trailing, bearing numerous small reflexed prickles; stipules linear, conspicuous; leaflets 3, rarely pedately 5, smooth, thickish, mostly persistent during winter, obovate, obtuse, coarsely serrate, entire toward the base; flowering shoots mostly glabrous, often bristly, and even glandular above when young, several flowered; flowers small, sepals ovate, mucronate, half the length of the obovate, white petals; fruit of few grains, dark red or purplish (Fig. 65).

Distribution.—In low woods or swampy ground from Nova Scotia to Georgia, and westward to eastern Kansas and Minnesota.

A pretty species, of interest to botanists only.

33. R. SETOSUS, Bigelow. *R. hispidus var. setosus*, Torr. & Gray. *R. hispidus* var. *suberectus*, Peck.

Stem erect or recurved, somewhat woody, densely beset with stiff bristles and long recurved prickles, which extend to the petioles and midrib of leaflets in young shoots, upper portions of plant glandular even on young shoots. Leaflets of bearing wood 3, oblong-obovate, obtuse or often acute and long-pointed at base, serrate towards the tips, sometimes nearly entire at base; leaflets of new shoots mostly 5, sharply serrate, acute or acuminate, veins prominent; branchlets and pedicels bristly and glandular, several flowered; flowers small, sepals ovate, mucronate, half the length of the oblanceolate white petals; fruit black, rather larger than in *R. hispidus*.

Distribution.—Swampy ground, and even in dry pastures in New York and New England.

34. R. LACINIATUS, Willd.—Cut-leaved, or Parsley-leaved Blackberry.

Stems procumbent, terete, glaucous, armed with strong recurved prickles, sometimes perennial at base; leaves pedately and pinnately foliolate, much parted and divided, sparingly villous, especially at the margins, persistent and evergreen when protected; petioles pubescent but not glandular; inflorescence cymose; pedicels bearing very short stalked glands, calyx somewhat pubescent and aculeate with slender prickles; sepals ovate-lanceolate, with a long foliaceous tip, exceeding the white obovate petals; fruit black, large, of good quality.

This is generally supposed to be a form of the European blackberry, but its origin is in doubt. It was found in the Botanic

Garden at Berlin and described and figured by Willdenow, in Watson's Dendrologia Britannica, 1825. It was imported to the United States from France by Charles Moré, of Yorkville, N. Y.

35. R. ULMIFOLIUS var. BELLIDIFLORUS hort. *R. bellidiflorus* hort. *R. fruticosus flore pleno* hort.

Stem recurved-prostrate or climbing, strong, angular and furrowed, finely pubescent above, but not glandular; prickles large, strongly reflexed, from a large, dilated, compressed base; leaves 3–5-foliolate, partially persistent; leaflets broadly oval or obovate, acute or cuspidate, coriaceous, slightly rugose above, with very fine close white felt beneath; petioles prickly; panicles upright, terminal, felted, with prominent angles and large-based strongly recurved prickles, which are more numerous on the pedicels, lower branches of the panicle axillary, the upper subtended by linear-lanceolate bracts, which are more or less deeply 3-cleft at the apex; flowers double, red or white; sepals broadly ovate, cuspidate, finely white-felted, reflexed in flower; outer petals partaking somewhat of the felty character of the calyx; stamens and styles similar to the petals in color.

Cultivated both in Europe and America, the parent form a native of southern and western Europe and northwestern Africa.

This plant was found plentiful and well established at Frederick, Maryland, by A. Commons, in 1876. It is there known as "Blackberry Rose," owing to its comparatively double and showy flowers. The white-flowered form was received at the horticultural department of Cornell University, from Berlin, under the name *R. spectabilis*, although in no way resembling the true *R. spectabilis* of the United States.

These appear to be the forms which have long been known as Double White and Double Pink Brambles. Downing describes them* as follows: "They are beautiful climbing shrubs of remarkably luxuriant growth, which may be trained for a great length in a season, and are admirably adapted for covering walls and unsightly buildings. The flowers are like small double roses, and are produced in numerous clusters in June."

The foregoing list includes the important species which have found a home in the United States, but

*Fruits and Fruit Trees of America, 446.

still others have been introduced, chiefly from Japan. In the American Horticultural Annual for 1871, p. 93, A. S. Fuller mentions *Rubus Armeniacus* and *R. Kœfmeisterianus*, though the latter may have been a misprint for Hoffmeisterianus. The plant referred to was apparently the one better known as Grape-vine Raspberry. The same author mentions* *R. Japonicus* as having been sent out by the U. S. Department of Agriculture. These long ago passed out of cultivation.

Among the newer ones may be mentioned *R. trifidus*, Thunb., known as the "Fire Raspberry." This Japanese species is described by Professor Georgeson,† as follows: "The canes are very stout, seven to ten feet high, upright, cylindrical, smooth, no prickles; leaves large, palmately veined, mostly seven-cleft, serrate, dark green above and but slightly lighter below; berry of good size, scarlet; drupes pointed. It ripens gradually through July."

The Kew Index mentions *R. decumbens*, Thunb., *R. longipetalus*, Dougl., and *R. tetraphyllus*, Willd., as recognized North American species. Of these, *R. longipetalus* is given as a name only, while *R. tetraphyllus* is apparently a misprint, for at the place referred to the name is *R. heterophyllus*. *R. decumbens* I have not been able to trace. *R. nanus*, mentioned in Heller's Catalogue of North American Plants, was collected on the Island of Ascension, and is not an American species.

*Small Fruit Culturist, 116. †Amer. Garden, 1891, p. 204.

Part III

THE GROSELLES*

CHAPTER XII

CURRANTS

The currant, though less extensively cultivated than some of the other small fruits, fills an important place in the pomology of our country. Its sprightly and healthful qualities render it desirable to the consumer, and its staple character makes it a comparatively safe crop for the producer. As before intimated, it is almost wholly a northern fruit, having no commercial importance in the southern states. Neither currants nor gooseberries receive notice in "Florida Fruits," by Helen Harcourt, though other small fruits do. It does not prosper in hot and dry climates. Even in Nebraska it does not succeed well. The plants thrive and look healthy, but are comparatively unproductive, so far as I have been able to

*I find no English word in use which includes both currants and gooseberries. Since there is an evident need for such a term, I have adopted the word groselle. This is a modification of the old French word *groiselle*, or *groisselle*, which was used for both these fruits before a separate term was employed to designate the currant. The present French word *groseille*, meaning a gooseberry, also formerly included both.

observe them. The fruit is but little seen in market, which is probably the result of unfavorable experience.

Figures in regard to the extent and value of the crop are not readily available, but something of its importance can be estimated from the number of acres devoted to the production of plants by nurserymen, as shown by the census report of 1890. The returns at that time showed 2,020 acres devoted to currants in the nurseries. Of this number 1,316 acres were in one-year-old plants and 704 acres in two-year-old plants. Ohio leads in the production, with 451 acres, followed by New York with 405 acres and Illinois with 383 acres. But 23 acres are reported from the south Atlantic division, which includes New Jersey, 7 from the south central, and 11 from the western division. The total acreage is less than half that of either strawberries, raspberries, blackberries or grape vines. About twenty-five thousand plants are grown on each acre. The estimated cost of producing one-year-old plants is about $1 per hundred. The average selling price reported in the north Atlantic division is about $1.85, and in the north central division $2.08 per hundred. The estimated cost of two-year-old plants is about $1.50 per hundred, and the average wholesale selling price $3 in the north Atlantic and $2.60 in the north central division.

These figures show plainly the region of adaptation of the currant, though the small acreage in the extreme western portion may be due to a want of satisfactory markets rather than to a lack of adaptation in climate.

There seems to have been a boom in currant culture about 1856, and American nurserymen were not able to keep pace with the demand,* but in recent years there has been little fluctuation, the demand having been steady with the markets seldom glutted.

SOIL AND LOCATION

Currants will thrive and bear some fruit on almost any soil, but, as their natural habitat indicates, in order to produce really satisfactory and profitable crops they need a cool and moist soil. Experience has fully demonstrated this fact. The best results are, therefore, to be expected from strong clay loams. Even a stiff clay, under good culture, will be found satisfactory. Strong, moist, sandy loams, if not too light, are also good. In the selection of a site, the natural habitat of the plant will point to a cool northern exposure. A proper site may in part offset the disadvantage of an unfavorable soil. Low, moist ground, with some reduction in the intensity of the sun's rays, will be found advantageous. For this reason the currant often thrives well in orchards. This is most satisfactory in those regions approaching the limit of its adaptability to culture. For family use, it may be planted on the north side of buildings or fences. Mulching tends to accomplish the same end, since it keeps the soil shaded and cool.

Regions somewhat elevated are generally more sat-

*Horticulturist, 1856:210.

isfactory than lower altitudes, especially toward the southern limits of its range. It is stated* that in Pennsylvania better fruit is produced at an elevation of 1,000 feet than on plateaus near the sea, the leaves falling earlier on the lower lands, and the fruit being smaller in consequence the succeeding year.

FERTILIZERS

The currant is a rank feeder, and needs a rich soil, with liberal fertilizing. Yet the roots are small and fibrous, and do not extend far for their food. It must be supplied in liberal quantities and close at hand. While no fruit will live and apparently thrive under greater neglect than will the currant, it is equally true that no fruit will more quickly or fully respond to liberal treatment. Too often it is relegated to the fence corners, without care or culture, there to battle with sod and currant worms from year to year. Little wonder that the returns are sour and small! Liberal applications of stable manure, preferably in the fall, supplemented with the addition of wood ashes or potash in the form of commercial fertilizers in the spring, are always in order. Currants contain† 0.11 per cent of phosphoric acid and 0.27 per cent of potash, while stable manure contains only about one-third more potash than phosphoric acid, which shows the need of additional potash. There is little danger

*Gardeners's Monthly, 1887:208.
†Exp. Sta. Handbook, p. 402.

of too rank growth or of diminished fruitfulness from an excess of stable manure. Observations at the Massachusetts State Experiment Station* show that the desirable qualities of the fruit were increased in every case by the application of potash fertilizers. A comparison of sulphate and muriate of potash at the Geneva (N. Y.) Experiment Station showed no practical difference in favor of either.† To sum up, fertilizing for the currant does not differ from that required for other fruits, except that it needs to be more liberal than in most other cases, if satisfactory returns are to be obtained.

PROPAGATION

Currants are readily propagated from hard-wood cuttings made from well-ripened shoots of one season's growth. The cuttings may be taken and planted either in fall or in spring, but the common custom among nurserymen is to take them in early autumn, as soon as the leaves mature. The leaves commonly begin falling as early as August, but they are frequently stripped a week or so before the cuttings are taken, which is usually done the last of August or first of September. They may then be planted at once, or tied in bundles and buried upside down with two inches of soil over the butts. In this position they may callus, and even form roots, before winter.

*Mass. Agr. Rept. 1884:444. Exp. Station Bull. 7.
†Annual Rept. 1890:283.

They may be taken up and planted later, removed to a cellar and buried in sand during the winter, or be given an additional covering and be left where they are until spring. If planting is deferred until spring, it must be done very early, as they begin growth at a low temperature, and must receive attention at the earliest possible moment. The commoner practice is to plant in nursery rows soon after the cuttings are taken. They are said to root more quickly if packed in damp moss a week or two before planting. The cuttings are ordinarily made from six to eight inches long, though the older writings recommended them to be a foot long. The base should be formed with a clean, square cut just beneath a bud. The top is commonly a slanting cut some distance above the uppermost bud. Planting may be done by means of a spade, but is more conveniently and rapidly done by plowing furrows and setting the cuttings against the land-side of the furrow. One or two buds only are left above the surface of the ground, and the earth should be firmly packed about the base of the cuttings. If set early in September, many of the plants will form roots and establish themselves before winter, being in condition to begin growth immediately in spring. As freezing weather approaches, a shovel plow is sometimes run through the rows, in order to throw the earth toward but not over the cuttings. This leaves a depression along the rows, and the plants are then easily protected by covering with straw or coarse manure. Mulching in some form is essential during the winter, if currant cuttings are

planted in the fall. Rich land should be selected, and heavy dressings of well-rotted manure are useful.

G. A. Marshall, of Arlington, Nebr., gives the following method of propagating the currant. As soon as the leaves fall, which is about September first, the cuttings are made, nine inches long, much of the success of the operation depending upon long cuttings in the dry climate and light soil of Nebraska. They are then buried with the butts up and about three inches beneath the surface of the ground. About the first of November they are taken up and planted in nursery rows, and a ridge of earth thrown over them so that they are covered about two inches deep. In the spring this covering is raked away, so that the tips are left just below the surface of the ground. This method is interesting, because it shows something of the modifications demanded by a dry climate.

Single-eye cuttings under glass, or green-wood cuttings may be used, but are less satisfactory than hardwood cuttings, and are only used under special circumstances. Plants may also be grown from layers, and even from tip layers, like the black raspberries, but these methods have little to recommend them. It was formerly advised to cut out all the lower buds in planting cuttings, in order to insure a tree form of growth, but this is seldom practiced now. Plants so grown are of interest as curiosities or novelties, but are not satisfactory in field culture.

New varieties are grown from seeds, which should be taken as soon as the fruit is ripe. They may be washed from the pulp and dried like vegetable seeds,

but it is better to sow or mix them with sand at once, and not allow them to dry. If mixed with sand, they should be buried or kept in a cool, shady place, and sown very early in spring. They may be sown, not over half an inch deep, in flats or in the open ground, in fine, rich and mellow soil. Partial shade and a light mulch of fine manure will aid in retaining moisture and prevent the ground from baking. The seeds germinate at a low temperature, and are likely to start too early unless kept in a shaded place. If sown at once in flats, the flats can be kept in a cool, shaded place during the winter, and given partial exposure in spring. Plunging them in the soil will aid in preserving uniform conditions of moisture, and covering with a wire screen will insure safety from destruction by mice or other animals. If a greenhouse is available they may be brought inside toward spring, where the seeds will germinate quickly. The young plants may be potted off when two or three inches high, and planted out when well established.

PLANTING

The first essential in planting fruit is a thorough preparation of the soil. For currants, the land should receive a heavy dressing of well-rotted stable manure, be plowed deep, and, if the underlying layers are hard and impervious to roots and moisture, subsoiled. One may choose almost any distance apart to set the plants, and find it recommended somewhere in horticultural literature. The distances ad-

vocated vary from three-by-four feet to five-by-eight feet, with every possible intermediate combination. It will generally be found satisfactory to place the rows six feet apart, with the plants four feet apart in the rows. If the design is to cultivate both ways, five feet apart each way may be better. Cross-cultivation is commonly only needed at intervals, and the wider row should be in the direction most convenient for cultivating.

The land should be in fine, mellow tilth as deep as plowed. It should then be marked both ways, with furrows in one direction. It will be all the better if these furrows are made deeper than necessary to receive the plants, in order to insure their being set in a well-fined bed. The setting is easily done by placing the plants against the land-side of the furrow and drawing the earth about them, packing it firmly about the roots with the feet. No one point is more essential than this thorough firming of the soil about the roots. A layer of loose, fine soil should be left at the surface, to act as a mulch and prevent the packed soil beneath from drying out. The remainder of the furrow may be left to be filled in as cultivation progresses later on. One-year-old plants, if vigorous and well grown, are quite as satisfactory and cost less money. They are easily set, meet with little check in transplanting, and make a better growth than if left in the crowded nursery row during the same time.

The earliness of the currant in starting into growth in spring is a point in favor of fall planting. This

depends so much upon climate, however, that it is unsafe to lay down a general rule. Throughout the western plains, where the winters are dry and open, fall planting is always uncertain, though with careful protection it may succeed. Whatever the location, if the planting is done early enough in spring there is nothing to fear. If neglected until the plants have started into growth, the check must always seriously affect the first season's results.

SUBSEQUENT TILLAGE

Cultivation of the currant should be shallow. The roots run near the surface, and are likely to be injured by plowing, or even by the ordinary cultivator. Frequent stirring of the soil with a light harrow-tooth cultivator or a spring-tooth cultivator having the teeth set well back, is most desirable. It may be owing to this habit of shallow rooting, that both the currant and the gooseberry succeed especially well with mulching. Any refuse material like straw, weeds, wild grass, or even coal ashes, may be used. The mulching not only replaces cultivation in keeping down weeds and retaining moisture, but helps to keep the fruit clean as well. This is a good way to grow currants for family use, especially if they occupy small or inaccessible corners of the yard or garden, where cultivation is inconvenient or must be done by hand. In the well arranged fruit-garden, where the plants occupy definite rows, and also in field culture, cultivation is far more practicable than mulching.

PRUNING

Pruning the currant is often neglected, yet productiveness largely depends upon it. Plants will produce some fruit no matter how treated, and hence are likely to be treated very indifferently. The fruit is borne both on old and young wood, the best and most of it apparently near the base of the one-year-old shoots and on short one year-old spurs from the older wood. Consequently, most of the young wood may be cut away, or the old wood may be cut out, leaving young shoots, and fruit will still be produced. The younger the wood the finer the fruit, as a rule, but the plants are likely to be less productive unless a fair supply of wood more than one year old is left. Yet this older wood soon becomes weak, and produces small and inferior fruit.

Fig. 66. Tree-form currant.

The older plan of training to a tree form (Fig. 66), by removing the lower buds from the cuttings when planted, is now practically discarded. The plants are less productive, and if attacked by the currant borer, the whole plant is destroyed instead of a single stalk, as when grown in the bush form. If the tree form is desirable for novelty or ornament, six or eight shoots are selected, as the bush develops, to form permanent branches. These are cut back to four to six inches every year till the bush is full grown, and afterward to only two or three buds. All lateral shoots are cut to within an inch of the old wood each year.

For practical field culture, from four to eight main stems are allowed, and these should be frequently renewed. It is safe to say that wood over three years old should not be allowed to remain. Some expert growers of long experience say that none over two years old should be left. Superfluous young shoots should also be cut away, but the buds at the base of these may well be left, as they develop into fruit-bearing spurs. A difference of opinion exists in regard to cutting back the young growth. The longer the old wood is left the greater will be the demand for cutting back. This method may give increased productiveness, but finer fruit will result from frequent renewing. In any event, the more vigorous shoots should be shortened-in, to prevent the bush from becoming straggling and to preserve its balance. Since the greater part of the fruit is borne near the base of the shoots, shortening these may tend toward a better development of the fruit spurs, especially if the shoots are

nipped back in summer, when they have reached sufficient height. In common practice, a liberal and judicious thinning out of old wood and superfluous young wood in early spring will be all that is required.

Experiments in thinning the fruit, made in New Jersey,* showed that when the outer half of the flower cluster was removed with a pair of scissors there were .15 per cent more berries to the cluster, and the berries were 7 per cent heavier. The quality also seemed to be better.

Various fancy methods of training are resorted to by those with a taste for oddities. Sometimes they are trained in "pillar" form, one upright shoot being tied to a stake and the side branches kept very short. They may also be readily trained against a wall, and it is said that specially fine fruit may be obtained on a north wall. They have even been grafted, from time to time, in order to secure standard or tree forms, *Ribes aureum* being most commonly employed as a stock for this purpose. These methods were chiefly in vogue early in the horticultural development of our own country, but are now little used.

GATHERING AND MARKETING

The currant, like all other fruits, should be picked only when dry. Although a firm fruit, which stands shipment well when properly treated, it will readily spoil if gathered and packed when wet. Much care

*Garden and Forest, 3:19.

is needed to prevent pickers from crushing the berries or tearing them from the stems. It is so much easier to grasp a cluster and give it a pull than it is to carefully sever the stem, that only the strictest vigilance will insure proper care in the work. This is written with a very distinct remembrance of the work of some Irish girls, who thought it much more convenient to strip the berries from the clusters and throw them in loose than to pick the stems at all, especially in the middle of the baskets, where less likely to be detected. All such berries will quickly spoil, the juice which exudes from them will soon render the others wet and sticky, and a general collapse of the whole package is likely to result. Varieties like the Fay, which have more clear space of stem at the base of the clusters, have a distinct advantage in this regard, for they may be more readily picked without crushing any of the fruits. For shipping purposes, the fruit must be picked while still hard and firm, in order to carry well, but for home use or near market it should not be picked too soon, especially for dessert use. If left on the bushes until thoroughly ripe and soft, they make an admirable dessert fruit. For this purpose the White Grape is one of the best, being less acid than most varieties. The fruiting season may be prolonged until autumn, if the fruit is protected by covering the plants with light cheesecloth or netting.

The fruit is commonly marketed in quart baskets, put up in bushel crates like other berries, but of late years the grape basket has been gaining in favor as

a package, and is now very largely used. The nine-pound basket is the size preferred by most markets. This is a convenient size for the consumer, especially if purchased for jelly or preserving.

USES

The paramount use of the currant is in making jelly, for which purpose it is unsurpassed. The red varieties are preferred owing to their higher color, but it is said that if white currants are scalded before pressing, they make a rich, red jelly, not as dark as that from red varieties, but very handsome. The fruit, either green or ripe, makes excellent pies or sauce. It is especially satisfactory when used in combination with fruits which lack sprightliness or acidity. With a few currants added, even the Russian mulberry becomes a most appetizing fruit, and the juneberry seems to be all that one could wish. The currant supplies the requisite acidity, and these fruits furnish the richness of flavor which the currant lacks. In canning it preserves its qualities intact, so that it is nearly as available in winter as in summer. Currant shrub is a pleasant summer drink, made from the ripe fruit crushed and compounded like lemonade. The juice is said to be very useful in soothing fevers. At one time the fruit was reported* as having a steady demand in St. Louis for use as a flavoring in soda water.

*Illinois Hort. Soc. 1890:157.

DURATION OF PLANTATIONS

The length of time during which plantings will continue productive will depend much upon the care and treatment which they receive. Downing advised* renewing them every six or eight years, as finer fruit, with less trouble, can be had from young bushes. He was then recommending the tree form of culture, however, and these fail sooner than when a number of stalks are grown and renewed as fast as they become weak. As against this view, it does not occur to the ordinary farmer that they need to be renewed at all. To him a currant bush, once planted, should take care of itself, and last indefinitely, or at least as long as an apple tree. That is just what the plant ordinarily does under the conditions to which the farmer too often subjects it. It looks out for itself, but does not devote any great amount of energy to the production of a high grade of fruit. So, too, with good care, liberal fertilizing and frequent renewing, bushes may be kept in a profitable condition for many years. Practical growers, however, seem to find it advisable to replant after eight or ten years of service. The cost of replanting is slight, and the advantage of young and vigorous plants will more than repay it. If for any reason it is found desirable to rejuvenate old bushes in the home garden, cutting them off close to the ground and working manure into the soil will infuse new life into them.

*Fruits and Fruit Trees of America, 488.

HARDINESS

The question of ability to endure cold hardly enters into consideration in connection with the currant. It endures the most severe winters, in the extreme northern limits of the United States at least, and comes out in spring with every bud unharmed. The question of hardiness here centers not on ability to endure cold, but on ability to endure heat, and in this it fails, as already shown by its distribution and its more or less complete failure in warm climates.

YIELD

Perhaps no fruit is grown in which the yield varies more than with the currant. This is largely owing to the fact, already indicated, that it will grow and produce something under almost any kind of treatment. It is doubtful whether, taking the currant fields of the country as they run, the yield per acre would be over fifty bushels. Yet there are growers who report as high as 250 bushels. With good care they ought to yield from 100 to 150 bushels per acre. Yet it should always be remembered that there are many drawbacks to the production of all kinds of fruit, and while this may seem very easy to obtain, when compared with the exceptional yields occasionally reported, it will be found that only by high culture and the most careful attention to details will even these yields be reached. In garden culture, from two to four pounds per bush may be expected.

As instances of exceptional yields, five and one-half tons from one and one-fourth acres, or 220 bushels per acre, is reported* as the best yield on the Hudson previous to 1871. W. W. Farnsworth reported a crop in 1889† which averaged six quarts per bush, or 320 bushels per acre. Sixteen tons from three acres was reported by J. S. Stickney, of Wisconsin, the same year‡. Let no one mistake these for probable yields, however, in forming estimates of the results which are likely to follow prospective planting.

PROFITS

Profits vary greatly, not only with methods of culture, but also with conditions of the market. There have been periods at which they have proved unprofitable, and again they have yielded large returns, but this fluctuation is no greater than with other fruit. The larger markets are frequently filled and the price low, but Doctor Hoskins is authority for the statement§ that the New England market is never overstocked, and that they are more profitable than strawberries or raspberries. To the skillful grower who is near a market or has exceptionally good facilities for shipping, the currant will prove profitable, while to the ordinary farmer, unaccustomed to their care, and remote from market, they will prove unprofitable.

*Horticulturist, 1871:368.
†Popular Gardening, 4:111.
‡Illinois Hort. Soc. Rept., 1889:21.
§Rural New-Yorker, 1896:234.

At six cents per pound or eight cents per quart, they should prove a satisfactory crop. Canning factories use them in large quantities at about four cents per pound, and they weigh about forty pounds per bushel, making the equivalent of $1.60 per bushel. This, with a convenient location and good culture, to insure a yield of not less than one hundred bushels per acre, will yield a fair return, provided pickers are readily obtainable in sufficient numbers, so that enough can be grown to make it an object.

BLACK CURRANTS

The treatment of the black currant does not differ materially from that of the red. The bushes grow a little taller, and may require a little more room. This can be easily given under ordinary circumstances, for in most localities one bush will supply the demand of the whole community. A convenient method of pruning the black currant is quoted from the Garden by the Canadian Horticulturist, 1896, page 198. It consists in cutting out the bearing branches when the fruit is ripe, carrying them to a shady place and there picking the fruit at ease. The annual renewing thus given is said to produce well-ripened wood and fine fruit, since fruit borne on old wood is much inferior.

Notwithstanding the lack of popularity of the black currant in America, we might do well to cultivate it more than we do. It undoubtedly possesses more value than we accord to it. It is stated by Prof.

Budd* that if the fruit is scalded for a few minutes in boiling water, then put into fresh water for cooking, the peculiar flavor of the skin will be wholly removed, and that when canned it is much like cranberry sauce in flavor and color. The fruit is credited with some medicinal qualities, especially in alleviating inflammation or soreness of the throat. Jelly from the fruit, mingled with water, or the parts of the plant steeped, are said to be useful in bowel and summer complaints. People accustomed to its use certainly relish it, especially for jam and jelly. Fuller states† that the people of Siberia use the leaves for making a drink the same as we use tea. Loudon says‡ that the dried leaves so much resemble green tea in flavor that a very small portion of them added to black tea will communicate that flavor so effectually as to completely deceive the taste. From Loudon's statements it appears that the fruit, either dried or in the form of jam or jelly, is very widely used throughout Europe against affections of the throat.

*Bull. 16, Ia. Exp. Sta., p. 364.
†Small Fruit Culturist, p. 188.
‡Arboretum et Fruticetum Britannicum, 2:985.

CHAPTER XIII

GOOSEBERRIES

The gooseberry is one of the lesser lights in the pomological firmament of the United States. It is apparently prized and appreciated less than almost any other fruit. It is extremely sour, and the custom of using it only in the green state prevents its better qualities from becoming known. Many people do not care for it, and the demand is much less than for the berry fruits, while the supply is usually more than correspondingly less. In spite of this apparent indifference, it has many good qualities to commend it. In the green state, as generally sold, it bears shipment exceedingly well, reaching the consumer, when properly handled, with no waste, and in as good condition as when it left the plants.

Some idea of the extent to which the gooseberry is cultivated may be gained from the census report of 1890, which shows 1,009 acres of plants to have been growing in the nurseries of the United States. This is only half the acreage devoted to currants, while the average number of plants produced from an acre is given as 14,000, as against about 25,000 currant plants per acre. This indicates that the planting of currant bushes is over three and one-half times as great as the planting of gooseberry bushes.

Like the currant, the gooseberry is a northern plant, and refuses to be content in a hot climate. It proves a complete failure in the southern states and along the Gulf coast. In Nebraska it seems to thrive better than the currant. It loses its leaves early, and the fruit is decidedly smaller than in the eastern states, yet the plants make a good growth, appear healthy, except in the early loss of leaves, and are fairly productive. The English varieties produce an occasional fruit, but so far as tested may be termed a practical failure. It should be remembered that the summers are here hot and dry, consequently unfavorable to these fruits. Frequently, however, the early part of the season is favorable, so that the fruit has an opportunity to mature before severe heat and drought affect it. The chief injury in that case is undoubtedly in the early loss of leaves and consequent enfeebled condition of the bush the succeeding year.

SOIL AND LOCATION

The gooseberry is much like the currant in its soil demands. A cool, moist, strong and rich soil, deeply worked, is the requisition which it makes, and the more unfavorable the location in the way of climate, the more closely will this demand in the way of soil need to be met. Well to the north, in high altitudes or cool northern exposures, it will succeed well on sandy or even gravelly loam, though the rule is that the lighter the soil the less satisfactory the crop. Still, the opposite extreme is not advisable. A muck

soil will produce a strong growth but diminished productiveness, while a heavy, cold clay is hard to work, and may cause the bushes to heave. A strong clay loam, not liable to injury from drought, but well drained, well enriched, deeply worked and subsoiled, is the ideal. A cool northern exposure is desirable, if it can be had. Partial shade may be an advantage, but the plant does not appear to thrive under the shade of trees as well as the currant. For home use, the north side of a fence or of buildings is a good location. Proper selections of soil and location will do much to preserve a healthy condition of the bush, retain the foliage and prevent mildew.

FERTILIZERS

Growers of long experience agree that no fertilizer is better for gooseberries than well-rotted cow manure, very liberally applied. The plants are gross feeders, and a heavy top-dressing every autumn will be profitably utilized. This may be supplemented with a dressing of wood ashes, or potash in some other form, early in spring, especially if the supply of stable manure has been deficient. The soil must be rich, to insure good results.

PROPAGATION

The propagation of the gooseberry is much the same as that of the currant, though it does not root so readily from cuttings. The wood does not mature as early in the fall as that of the currant, so that

planting is oftener delayed until spring, though the cuttings may well be taken in fall, and be buried outside or placed in a cellar for winter, as directed for currants. If left until spring, they must be taken very early, as they push into growth at the first touch of warm weather. Cuttings are made from six to ten inches long, using only well-ripened wood of the current season's growth. Formerly the lower buds were cut out before planting, in order to prevent suckers from springing up, thus securing a tree form of growth. This is no longer followed in commercial growing, though it may be desirable where attractive bushes are wanted for the garden. The soil should be pressed firmly about the base in planting, and only one or two buds be left above the surface of the ground. Thorough mulching is imperative, if the cuttings are planted in the fall.

Some varieties, like Houghton, root readily from cuttings, but Downing and other strong, vigorous growers do not, consequently layering is oftener resorted to. It is generally believed that stockier and better plants are obtained from cuttings. Bent layers root readily, but this is too slow, and the number of plants produced is too small for commercial work, so that mound-layering is the method followed. For this purpose the plants are cut back severely in autumn, to induce many shoots to grow the succeeding spring. About July 1, when these have made their principal growth, earth is mounded up about and among them, leaving only their tips exposed. American varieties will root readily, and may be removed

the same autumn, but English varieties are left in this position for two seasons. The last of October, or before the ground freezes, the soil is thrown back, and the shoots are cut away and trenched or buried in the cellar for spring planting. In commercial work two grades are commonly made. In spring they are planted in nursery rows and cultivated for one year, when they are ready to go on the market. Some roots will have formed during the process of layering, and the plants will be in condition to make a much better growth when planted out than cuttings taken without previous layering.

Spring is a busy season with the nurseryman and fruit-grower, and the gooseberry is so impatient at the approach of warm weather that the layers are often planted in nursery rows when removed from the parent plants in fall, and mulched during winter. In favorable climates this will prove satisfactory, but where the winters are dry and open, as on the plains, the loss of plants is likely to be large, unless they are wholly covered with earth. If bushes are to be managed principally or exclusively for the production of plants, they should be set in rows eight feet apart and close together in the row. This will facilitate the work of mounding and removing the soil in layering, as much of it can be done with a plow.

For home use, the suckers which spring up about the base of the old plants may be removed and planted. They commonly have some roots attached, and grow readily. The older writers warn us against their use, but apparently for the reason that they, too,

are likely to throw up suckers from the roots, and when the fashion was to grow the plants only in tree form this was considered a serious fault. Bent layers may be employed in a small way. By this method, the branches are held beneath the soil by a forked peg and the tip allowed to grow upward. A slit is made on the under side of the arched portion which is buried in the ground, in order to induce more rapid rooting, by checking in some degree the flow of sap from the parent plant. Layering the tips, like black raspberries, is also said to succeed, though not a common method.

A writer in the Gardener's Monthly for 1885, p. 49, says that the readiest and quickest way to propagate the English gooseberry is by pieces of its own roots. Old bushes are dug up in spring, the roots chopped in pieces three to four inches long, and planted in nursery rows three or four inches deep. He says that they will grow more in one year than a cutting will in two or three. This method is certainly not in common use, and I cannot vouch for its success. Two trials in the greenhouse early in spring, embracing both English and American varieties, have resulted in complete failure.

New varieties must come from seeds, which should be treated as directed for currants. It is not difficult to grow plants by this method. There is likely to be little retrogression, and in rare cases there may be an advance in valuable qualities. A French article which appeared in the Horticulturist in 1849,* trans-

*Horticulturist, 3:557.

lated from the Revue Horticole, states that seedlings withstand the heat of French summers much better than cuttings, and recommends propagation by seeds rather than by other methods.

Grafting is easily done, the Missouri currant being the stock oftenest used. According to Robert Manning,* the best results are obtained by side-grafting under the bark in August, the top being cut down in spring and the snag removed afterward, as with budded trees. Although quite extensively practiced at one time in the production of standard bushes, and as a supposed remedy for the mildew, the fad soon died out.

PLANTING

The methods of planting recommended for the currant are equally applicable to the gooseberry. If rows are placed six feet apart in the direction most convenient for cultivating, and the plants four feet apart in the opposite direction, in order to afford opportunity for cross cultivation when the plants are young, and at intervals thereafter, they will have room enough for proper development, with convenient space for their care and for gathering the fruit.

The same arguments as with the currant will apply in regard to the choice of season for planting. These fruits drop their leaves so early that fall planting may be done much earlier than with most other fruits, even in September, allowing the plants to become

*Trans. Mass. Hort. Soc. 1879:37.

well established before the advent of cold weather. This is one of the hardiest fruits, but the grower who withholds the proper care in planting will inevitably reap the recompense for his ill doing.

AFTER TREATMENT

Since the gooseberry is subject to greater injury from drought than the currant, there is the more urgent need of complete and thorough cultivation. As with the currant, it should be shallow but frequent. Hardness and dryness of the soil are especially injurious. The better the cultivation, the cooler and moister can the soil be kept, and hence the nearer will be the approach to the normal conditions under which the gooseberry is happy and its fruit grows fat. Like the proper selection of soil and location, suitable cultivation will materially aid in preserving the health of the plants and preventing mildew, though by no means a remedy for that disease. Mulching also succeeds well, preserving the soil in a cool and moist condition even better than cultivation.

PRUNING

Left to itself, the gooseberry soon becomes a tangled thicket, the fruit in consequence being small and difficult to pick. It produces much more wood than ought to remain for each year's fruiting. It is imperative that this be reduced, if the best results are to be hoped for. The particular manner in which

it is done is of far less importance. Berries are produced from all parts of the bush except the present year shoots and the very old wood, but the finest fruits are borne on one-year-old branches. After two or three years in bearing the wood begins to fail, and the fruit borne from it likewise declines. The principle, therefore, should be to carefully guard the vigorous young wood, allowing it to replace that which is older before the latter has a chance to fail. The weak young shoots should be cut away, or perhaps be cut back to two or three buds, if the bush is still thin, the vigorous ones moderately cut back, and as much old wood cut away as can be spared without interfering with the productiveness of the bush. Benj. G. Smith states* that he prunes as carefully as he does grape vines, some on the spur system and some with long shoots, with equal success. This is significant, in showing that the method is of minor importance. The essential thing is to so renew that the bearing wood shall always be strong and vigorous, and the amount of such wood not greater than the bush is able to support and fill with well-developed fruit. In northern localities an open top is desirable, but where the summers are hot a thicker growth, with more shade, may be better. Shortening-back the lower branches severely will aid in keeping the fruit up from the ground.

In the tree form of pruning, from six to ten main branches are allowed to grow, and all suckers are cut away. These main branches may be allowed

*Trans. Mass. Hort. Soc. 1883:123.

to divide as the bush gets older. They are annually shortened to a few inches of new growth and the side shoots cut back to from one to four buds.

In practical culture, thinning is all done by the amount of wood removed. In the production of prize berries, as practiced by English growers, thinning is an absolute necessity. The largest fruit can only be produced by closely limiting the number which the plant is allowed to carry. Thinning is no less important in commercial work, because done by removing wood, instead of individual fruits.

Various methods of training have been reported. In some cases they have been trained as single stems and tied to stakes; in others they have been made to cover arbors by carefully training up shoots at given distances apart. Some very remarkable bushes have been reported. In the tree form they have been said* to reach a height of sixteen feet, and others have been trained as standards with clear stems five feet high. In the Transactions of the London Horticultural Society, Vol. V, p. 490, a plant is reported which was forty-six years old, measuring twelve yards in circumference and which had produced several pecks of fruit annually for thirty years. Another, thirty years old, was trained to a building, and measured 53 feet 4 inches from one extremity to the other. This bore four or five pecks of fruit annually.

*Tilton's Journal, 9:378.

GATHERING AND MARKETING

Picking gooseberries looks more attractive than it is. I well remember the longing eyes with which a crowd of inexperienced pickers watched the gooseberry rows, when working on currants, and with what eagerness they pounced upon them when at last the currants were done. The fruit looked so much larger than the currants, and so nice to pick! But experience brought a great change. They had forgotten to reckon with the thorns, and soon longed for currants again. The Downing, our best well-tested variety, is one of the worst in this respect. The thorns are always ready, and apparently never fail to get in their work. This feature does much to check increased cultivation of the gooseberry. Vigorous pruning, to keep the bushes thin and open, will materially aid in the matter, and the picker soon learns to avoid too careless contact. Another method of circumventing the difficulty is possible, from the fact that the berries are marketed when green and hard. This consists in wearing thick leather gloves and in stripping the berries from the branches. They are then run through a fanning mill to drive out the leaves. This method is most satisfactory in commercial work. It will not answer for ripe fruit, which is too easily crushed. Pickers are paid about 1¼ or 1½ cents per quart, and will average from sixty to one hundred quarts per day.

At the present time the market calls for green

gooseberries only. In this stage the fruit will carry almost any distance in first-class condition, and need not be sold the day it arrives. Ten-pound grape baskets are the most satisfactory packages for shipping and general market purposes, though the quart berry baskets are still much used. It is a pleasure to pack this fruit for shipment. It is so clean and solid, and there is a feeling of security that it will remain so until it reaches the consumer. The markets are seldom overstocked, though P. T. Quinn stated before the Pennsylvania Fruit Growers' Association in Philadelphia, in 1872,* that he had seen 1,000 barrels thrown overboard for want of a market. To this Charles Downing added that they ought to be all dumped into the river, which shows that the gooseberry was not a favorite with him.

USES

The fruit is commonly used in pies, stewed, canned or for jelly. That it makes a good jelly is evidenced by an ingenious process of imitating it reported by the Gardener's Monthly for 1884, page 204, which states that gooseberry jelly is made from seaweed, the color being given by fuchsine or similar material, and the flavor by a mixture of acetic ether, tartaric acid and other substances.

The good qualities of the gooseberry are not confined to the green state, and there is a growing

*Horticulturist, 1872:112.

appreciation of its value when ripe. The flavor of a ripe gooseberry is hardly to be surpassed among fruits. When fully ripe and sweet it makes a fine table fruit, to be eaten with sugar and cream. Dr. T. H. Hoskins is authority for the statement* that ripe Houghtons are an excellent substitute for cranberries, as a sauce for meat. So close is the resemblance that at his table it is often necessary to explain that they are not cranberries. They are cooked enough to burst the skins, then put up in fruit cans, but not sweetened till wanted for use. Since they are much cheaper than cranberries, and can be grown anywhere, this is a strong point in their favor.

A method of keeping green gooseberries which seems to have been in vogue before the process of canning was known, consists in filling a jug or bottle with sound fruit, taking care that no bruised or crushed ones go in, then filling with cold spring or well water, corking tightly and putting away in a cool cellar. Doctor Hoskins† makes the statement that they can be so preserved perfectly the year round, without sealing, though it is generally recommended to seal them. This method is certainly very simple and, if as satisfactory as it is said to be, makes fresh gooseberry pie available at all seasons of the year. Another method of keeping, recommended by the Prairie Farmer,‡ is to put them into bottles

*Rept. Michigan Hort. Soc. 1884:262.

†Ibid: 277.

‡Horticulturist, 3:132.

when perfectly dry, then cork the bottles tight, cover the corks with sealing wax, and partially cover the bottles with sand or earth in the cellar.

DURATION OF PLANTATIONS

In the older method of pruning to tree form, the plants began to fail after six or eight years, and soon became unprofitable, generally bearing their best fruit about the fourth or fifth year from planting. In bush training, they remain in vigorous conditions much longer. Plantations twenty or twenty-five years old, and still profitable, are not uncommon. Much depends on the thoroughness with which the renewing process is carried on. Liberal fertilizing and good culture will also aid greatly. Generally it will be found more profitable to discard them after ten or twelve years, for replanting is not expensive, and the younger plants will be more vigorous and bear finer fruit. A slight difference in the quantity and quality of crops will soon offset the cost of replanting. No rule as to number of years can be valid, for of two plantations of the same age, one may still be perfectly satisfactory and the other wholly unprofitable, owing to differences in treatment and conditions. In commercial work, a safe rule will be to replant as soon as the first trace of waning vigor can be detected. It is not a question of how long they will continue to bear well, but of which will prove the more profitable, the old planting, with its regular care, or a new one, with the added expense of another plant-

ing. If these points were carefully weighed, replanting would doubtless be much more frequent than it now is.

HARDINESS

Cold has apparently no effect on the gooseberry, at least such temperatures as are likely to be reached anywhere in the United States, and even far to the north. It stands unprotected through our severest winters without the loss of a bud, but if moved southward it soon becomes uncomfortable. It cannot endure scorching summer suns.

YIELD

Average yields of any fruit are hard to give, for results vary so widely. Full grown plants, vigorous and well cared for, ought to yield from five to eight quarts per plant, or, roughly speaking, from 300 to 500 bushels per acre, with plants four by six feet apart. One grower from Canada reports* one-half bushel per plant, set at this distance. This is exceptional, and should not be considered as a basis for estimates. At the Geneva (N. Y.) Experiment Station, in 1891,† plants gave an average of over ten pounds of fruit each, or about eight quarts. This would make about 450 bushels per acre with plants set four by six feet apart. Fuller‡ says that from

*Popular Gardening, 2:145.

†Annual Rept. 1891:474.

‡Small Fruit Culturist, p. 222.

200 to 400 bushels per acre of native sorts can be grown.

PROFITS

On the whole the gooseberry is one of the most reliable and generally one of the most profitable small fruits grown. The price per quart is not high, but the yield is large and the loss little. The average price in the New York market seems to be about $2 per bushel, though fine fruit sometimes reaches double that price. A. S. Fuller once said* that at $1.75 per bushel they paid him well, and there is no reason why they should not. Although one of the most satisfactory fruits for shipping, they often pay unusually well in the home market. If people could be accustomed to the use of the ripe fruit, there is no reason why the consumption of the gooseberry should not be immensely increased, with corresponding benefit both to growers and consumers.

ENGLISH GOOSEBERRIES

Although frequent mention has been made of the English varieties, it may be well to say a word further regarding their culture in the United States. Like all European fruits, they have been tried again and again, yet they have only succeeded here and there, when meeting peculiarly favorable conditions. Benj. G. Smith, of Cambridge, has successfully cultivated them for years, and occasionally other growers

*Horticulturist, 1873:112

have succeeded, but the general fact remains that the English gooseberry is not a success in America. It may produce a few good berries when young, but is almost sure to fail later. It is said to thrive well in Washington,* the climate of the northwest coast being more like that of England. In 1884, a motion was made at the meeting of the American Pomological Society to strike all English varieties from their list, but it was barely lost.

The reason for this failure of the large and fine English Gooseberries in the United States is that they are constantly attacked by mildew.

Any number of remedies have been suggested against the mildew in times past, the most common practice being to mulch the ground with manure, stones, tin cans, old boots, or other strange material which might be thought to possess especial virtue. Salt applied to the soil was vainly tried, and at one time grafting the plants on the Missouri currant was thought to be a remedy. Any of these things which afford a nearer approach toward the ideal conditions demanded by the gooseberry will aid in preventing the mildew, but none of them are infallible. Yet recent experiments show that under favorable conditions we can grow the English gooseberry by giving it the proper attention. Thorough and vigorous treatment with potassium sulphide or with Bordeaux mixture, as directed under the discussion of this disease, will hold it in check and admit of satisfactory crops being obtained. No slovenly or careless work

*Gardener's Monthly, 1886:271.

will answer; the work must be thorough, and done at the right time, or the enemy will still gain the mastery. Whether the English gooseberries are worth growing, especially for home use, is a fair question. Their only advantage is in their size and appearance, which of course commend them for market growing. Most varieties are inferior to our own in quality. The reader will find another account of gooseberries, by Beach, in Bulletin 119, New York Experiment Station.

CHAPTER XIV

VARIETIES OF CURRANTS

So far as fruit-producing species are concerned, the botany of the currant is simple, for the currant culture of the United States is practically confined to a single species, *Ribes rubrum*. It is to this species that all our red and white varieties belong. In its wild state the species is found both in Europe and America, and seems to be equally well adapted to the cooler portions of either hemisphere. It is in all cases a northern plant, found in cool, damp situations, and it objects to any radical change from these conditions. In cultivation, it has become somewhat variable in character of fruit and foliage. Instances are reported* in which both red and white fruits have been produced upon the same branch. In one case† three red, three white and one striped fruit were found in the same cluster.

The black currant of the garden is a European species, *Ribes nigrum*. Although not found in America in the wild state it seems to have had no trouble in adapting itself to American conditions. The American people, on the other hand, have not been so successful in adapting their tastes to the peculiar flavor which it has to offer, and the species has never become popular.

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*Darwin, Animals and Plants under Domestication 1: 400.

†Gardener's Chronicle 26: 268.

The closely related American species, *R. Americanum*, seems to possess all the good qualities of the European one, and is more ornamental. It might well receive attention from plant breeders. An American species much oftener seen in cultivation is *R. aureum*, better known as the flowering currant. This, though a black currant, is very different from the two preceding. Its fruit is often large, but produced in few-flowered clusters and ripens singly, so that it must be picked one by one. Its flavor, though peculiar, has not the disagreeable twang of the true black currants, but it lacks the qualities necessary to a good culinary fruit. Its most recent boom as a fruit-producing plant has been under the name Crandall.

Ribes aureum, *R. sanguineum*, and a hybrid between the two, known as *R. Gordonianum*, are frequently cultivated for ornament, the last two being more beautiful but less known than the first.

HISTORY

The currant is thought to have been unknown to the Greeks and Romans, as no mention of it is found in any of their writings. It seems to have first come prominently into cultivation about the middle of the sixteenth century, and according to Sturtevant,* received its modern improved form within fifty years following. The early English names "corans" and "currans" are thought to have been derived from the resemblance of the fruit to the little Corinth grapes or

*History of the Currant, Trans. Western New York Hort. Soc., 1887: 55.

raisins, these in turn taking their names from Corinth. In England, at times, currants were known as "red gooseberries" and "beyond-sea gooseberries." An equivalent to the latter name, "groseilles d'outre mer," was also applied to them in France. These names indicate that, if not native to these countries, the cultivated forms, at least, were received from elsewhere. The Dutch name "over-zee" indicates the same thing. Doctor Sturtevant thinks that the currant was first brought into culture from the northern countries through the Danes and Normans, though DeCandolle appears to doubt this.* The greatest improvement, however, seems to have been in the low countries.

All the principal types of the cultivated currants are found in the wild plants, and were reported at an early date. Improvement has only been within a limited range. Culture and fertility often appear to have a greater influence on this fruit than parentage. There are growers who still believe that the old Red Dutch variety is superior to any of the more recent introductions. It is undoubtedly true that with good culture it will surpass the newer ones under neglect. Thos. Andrew Knight† was of the opinion that by repeated growth from seed the currant would become sweeter, and perhaps in time, even insipid. The majority of seedlings grown by him from white crossed by red currants were red, but many first turned a color similar to the White Dutch, and then became brighter in color when ripe. He expressed himself as sur-

*Origin of Cultivated Plants, 277.

†Trans. London Hort. Soc. 3: 86.

prised at the range of variation which appeared, it being much greater than he had expected. Nearly all were mild and sweeter than the red parents, some were insipid, and some even showed a medicinal flavor. Experience does not seem to bear out his expectations in regard to an increasing sweetness, as the newer varieties are many of them more acid than older ones. D. S. Marvin* reports less tendency to sport among currant seedlings than in any other fruit with which he has had experience. He also adds that there is little or no tendency to reversion, nearly all seedlings being as good as the parent, except in case of the Fay, seedlings of which commonly bear smaller fruit than the parent, nearly half of them being white. Perhaps through its long sojourn in the low countries the currant has inherited something of the staid Dutch qualities of the inhabitants, and does not readily depart from long established customs. Yet no fruit, however stable, can long resist the influences of persistent and systematic breeding, and the currant has received too little attention in this line. There is no need that the currant should depart widely from the present types, for there is nothing wrong with them. A steady improvement along these same lines, with perhaps a limited reduction in acidity, is all that is needed, and there is no reason why this should not go on as long as horticulture exists.

The lists in this chapter and the next are intended to catalogue all the varieties of currants and gooseberries known in this country up to the close of 1897.

*Amer. Garden, 11: 716.

RED AND WHITE CURRANTS

(Ribes rubrum)

Attractor.—A variety from France. Plant moderately vigorous, with remarkably deep-lobed, sharply and deeply serrated leaves. Fruit medium to large, yellowish white. Bunches short.

Bertin Seedling.—Appears in the catalogue of the American Pomological Society for 1869.

Boston Lady.—Mentioned as a white variety, with fruit unusually large, bearing profusely, a quart having been picked from twelve inches of a single stem.—Gar. Month. 1860: 250.

Bronze.—Mentioned in Hovey's Magazine for 1861, p. 101, as having been under discussion at the meeting of the American Pomological Society.

Buist Long-bunched.—Originated by Robert Buist of Philadelphia, Pa. Described as a strong, vigorous grower, very productive. Fruit large, deep red, similar to Red Dutch in flavor. Bunches long and tapering. Leaves large and very thick.

Caywood Seedling.—A seedling received at the Geneva (N. Y.) Experiment Station from A. J. Caywood & Son, of Marlboro, N. Y. Described as a moderate grower, with spreading or drooping branches, very productive. Fruit more acid than the White Grape, of good quality, attractive, translucent, tinged with pale greenish yellow. Bunches of medium size, about two and one-half inches long. Berries large.

Champagne (Pheasant's Eye, Grosellier à Fruit Couleur de Chair).—Of foreign origin. Described as vigorous and productive. Fruit large, acid, not rich, of a delicate reddish pink, like a cross between the red and white, though the wood, foliage, and growth place it at once among the reds. Bunches medium, loose, slightly tapering. Ripens late.

Champion.—A white variety, described as tall, vigorous, and upright, with bunches of medium length. Berries a shade lighter than White Dutch, uneven in size, averaging below medium. Inferior to White Dutch in appearance, flavor, and quality.—Geneva (N. Y.) Exp. Sta. Bull. 95: 427.

Cherry.—This variety was obtained from Italy by M. Adrienne Seneclause, a distinguished horticulturist of France. He received it among a lot of other currants known there under the name *Ribes acerifolium.* He gave it the name in consequence of the extraordinary size of the fruit. It was fruited at the Museum of Natural History in 1843, and from the plants there grown was figured in the "Annales de Flore et de Pomone" for Feb. 1844. (Roe says

1848.) It was brought to the notice of fruit-growers in the United States by Dr. William W. Valk, of Flushing, L. I., in 1846.* It was figured in the Horticulturist as a frontispiece to the volume for 1854 ; also in Hovey's Magazine, 1855, p. 425. This is one of the best known varieties at the present day, being largely planted both for market and home use. It is described as vigorous, stocky, and compact when young, but becoming spreading with age. It tends to produce a single stock, not suckering as freely as other kinds. The buds, at or near the ends of the shoots, are often imperfect or wanting, differing in this respect from the Versaillaise. Its fruit is borne in short-stemmed clusters close to the wood, which renders it somewhat difficult to pick. Fruit averaging large, though not uniformly so, juicy, and fine flavored. Color bright red. Season early.

Climbing.—One of the most interesting variations in character of plant is a climbing currant reported from Chautauqua Co., N. Y.† The plant was found growing wild in a thicket when quite young, and transferred to the garden. After its climbing propensity became evident it was planted near the house and trained against it, reaching a height of twelve feet or more. It proved to be very productive, the fruit being of excellent quality. It is really not a climber, but produces long and weak branches, which may be secured to a trellis or wall. The fruit is large and red, nearly or quite the size of Fay. (Fig. 67.)

Dana White.—A white variety raised in Massachusetts. Bunches long and tapering, with berries as large as Varsaillaise, resembling the White Grape in color and quality. Fuller says that he obtained, from what he supposed to be a reliable source, five distinct varieties under this name.

Dr. Brete.—A French variety imported and cultivated by William S. Carpenter. Spoken of as a prolific bearer, with a long stem and short bunch. Fruit large, of excellent quality. Illustrated with a full page engraving in the Horticulturist for 1870, p. 45.

Eclipse.—Received at the Geneva (N. Y.) Experiment Station from H. S. Anderson, of Union Springs, N. Y. Described as a vigorous, upright grower, with bunches of medium length. Fruit varying from small to large, comparatively mild, acid, of good color, somewhat lighter than Fay.—Geneva (N. Y.) Exp. Sta. Bull. 95 : 419.

Fay.—Said to be a seedling of Cherry or Victoria, which originated in 1868 with Lincoln Fay, in Chautauqua county, N. Y. It

*Horticulturist 1: 439.

†Amer. Garden 12: 575.

was introduced about 1883, and became widely known and very generally prized, although receiving adverse mention from some quarters. Described as vigorous, though not as strong as Cherry, somewhat spreading, with the lower branches often trailing on the ground. Clusters long, with a good stem between the branch and the fruit, making it easy to gather. Fruit varying from medium to large, uniform in size, of good quality, darker than Red Dutch.

Fig. 67. Climbing currant.

Pulp less acid than the Cherry. The comments on this variety, made at different times and places, afford interesting reading. Witness the following:

One of the few new fruits which justify the rosy promises of the advertiser.—E. Williams, Garden and Forest, 1: 283. Additional commendation.—Ibid, 356.

More productive than other sorts, with fruit as large and as good, possessing one fault, and that being that the plants tend to develop a trailing habit, the lower branches lying on the ground, curling up at the end.—Ibid, 3: 405.

Good size, but not productive enough in Indiana.—Ibid, 6:347.

No larger than Cherry and Versaillaise, less productive, and much inferior in quality.—American Garden, 1888: 300.

Has not been over-praised.—T. Greiner, American Garden, 1889: 47.
Widely successful, but sometimes condemned.—T. H. Hoskins, Ibid, 212.
Fay, Red Dutch, and White Grape the only profitable ones.—Ibid, 294.
Not very satisfactory at Ithaca, N. Y.—Ibid, 310.
Good on light soil. Better with age.—Ibid, 349.
Largest and most prolific currant we have seen growing.—Pop. Gar., 11: 36.
Somewhat deceiving. Has the largest berries, but these contain less pulp and juice than other varieties, hence makes less jelly than smaller currants. Its size largely due to seed development. Strong shoots from the bottom often become loosened by wind or handling.—D. S. Marvin, American Garden, 11: 716.
The downward or spreading propensity is natural to this variety, and a decided objection to it.—E. S. Carman. Amer. Gar., 13: 447.
One grower holds it up with sticks and slats.—Ibid, 687.
A general failure in Michigan. Occasional bushes do well in sheltered places when protected from spring frosts.—Ibid, 378. (From Mich. Hort. Soc. Rept.)
The largest, finest and most prolific variety, but blooms too early and suckers badly. The suckers brittle and easily broken.—Ill. Hort. Soc. Rept., 1890: 146.
Claimed by the originator to be as large as Cherry, with a longer bunch, and producing five times the amount of berries of the Cherry. Had measured berries two inches in circumference.—Ia. Hort. Soc. Rept. 1880: 414.
John Burrows uprooted his plantation of Fays.—Ia. Hort. Soc. Rept, 1892: 75.
The leading favorite, and worthy of all that is said of it.—Annual Rept. Geneva (N. Y.) Exp. Sta. 1880: 283.
Far ahead of Cherry on light soils, the latter nearly as good on heavy soils.—Ibid. 1891: 472.
Especially liable to attacks of the Twig Borer.—T. T. Lyon, Mich. Expt. Sta. Bull. 118:20.

Gloire de Sablons.—Described as upright, vigorous, and only moderately productive. Bunches short. Fruit small, white, striped or splashed with red. Of interest chiefly on this account.

Gloucester Red. Probably an English variety which may never have been introduced in the United States. Described in Tilton's Journal of Horticulture for 1871, p. 188.

Gondoin Red (Red Provence).—Said to have been named from the town in France where it originated. Described as of good size, red, later than Red Dutch. By some this is regarded as the same as Red Provence, and is apparently mentioned by Prince under this name in the Horticulturist, Vol. 2, p. 266. In the Gardener's Monthly for 1876, p. 209, the editor, Thomas Meehan, mentions Raby Castle, May's Victoria, and Imperiale Rouge as synonyms.

Imperial Yellow (Imperial Jaune, White Imperial).—Said to be practically identical with White Grape.

Knight Early Red.—A variety originated by Thomas Andrew Knight, of England.

Knight Large Red.—Another of Mr. Knight's seedlings. Described as large, bright red, with large bunches, and very productive.

Knight Sweet Red.—Described as large, dark red, bunch long, tapering. Similar in quality to the Red Dutch but less acid. A vigorous, upright grower, with thick, dark green leaves.

La Hative (Hative de Bertin, La Fertile).—A French variety mentioned by Downing as a failure. Described as vigorous and productive, resembling the Cherry in fruit and cluster, but smaller and not quite so acid. In the Gardener's Monthly for 1876, p. 209, the editor, Thomas Meehan, gives this as a synonym of Red Dutch.

Lakewood.—A new red variety on trial in Michigan. Said to be a good grower, but not productive.—Mich. Exp. Sta. Bull. 118: 20.

London Market.—Mentioned as an English variety imported in 1878. Described as having racemes of moderate length, thickly set with large, light crimson berries, somewhat resembling Fay, though more delicate in texture, with seeds large and numerous. Firm, transparent, rather sharp acid.—U. S. Dept. Agr. Rept. 1891: 395.

London Red (Short-Bunched Red).—Described as vigorous, upright, and very productive. Clusters with a very short stem. Fruit medium to large, similar to Red Dutch in quality and color.—Geneva (N. Y.) Exp. Sta. Bull. 95: 418.

Long-Bunched Holland (Long-Bunched Red [?], Red Dutch Long-Bunched [?]).—A popular variety in many parts of the West. Described as an upright grower, the young wood reddish in color; productive. Bunches long and full of fruit; ripening late, of moderate size and fair quality, somewhat resembling Victoria. Retains its foliage and fruit later in the season than most varieties.

Magnum Bonum.—Mentioned as a red variety, not particularly distinct.—Horticulturist, 1854: 11.

Marvin Seedling.—Received at the Geneva (N. Y.) Experiment Station from D. S. Marvin, of Watertown, N. Y. Described as a moderately vigorous, upright grower. Bunches of medium length. Fruit mild, larger than the White Grape, being one of the largest of the white currants. Resembles White Grape in color, but more acid. Controlled by J. C. Vaughan, of Chicago.—N. Y. Exp. Sta. Bull. 95: 427.

Mills No. 20.—On trial at the Geneva (N. Y.) Experiment Station. Received from Charles Mills, of Fairmount, N. Y. Described as vigorous, somewhat spreading. Bunches of medium length. Fruit medium to large, rather uniform, color fine, later than Cherry and darker than Prince Albert, less acid than Red Dutch. Said to be a seedling of the Versaillaise crossed by Red Dutch.—N. Y. Exp. Sta. Bull. 95: 421.

Mills No. 22.—Of the same origin and parentage as the above. Described as moderately vigorous, somewhat spreading. Fruit of good quality, later than Fay, variable in size, less acid than Red Dutch.—Ibid.

Mills No. 28.—Of the same origin and parentage as the preceding. Clusters of good size. Fruit of medium size, dark red, mild flavor.—Ibid.

Mills No. 29.—Same origin and parentage. Described as vigorous and upright, with short clusters. Fruit variable, though averaging large, somewhat darker, though better in color than No. 22 ; of good flavor and excellent quality.—Ibid.

North Star.—An accidental seedling, introduced by the Jewell Nursery Company of Lake City, Minn. Described as vigorous, upright, or somewhat spreading. Bunches of medium length. Fruit of good color, much like Red Dutch, variable in size, comparatively mild acid. Reports as to its value vary much.

Palluau (Fertile de Palluau).—Mentioned by Downing and Fuller as a French variety of vigorous, upright growth, and productive. Fruit large, bright red, resembling Red Dutch. Thomas Meehan* gives this as a synonym of Red Dutch.

Palmer Sweet Red.—Mentioned in the Horticulturist for 1824, p. 161, as a fine, long-bunched, large-berried variety of vigorous growth, and productive.

Pitmaston Sweet Red.—Mentioned in the same place as the sweetest of all red currants, having short bunches, and small fruit. Said to have been raised by Mr. Williams, of Pitmaston.

Pomona.—An Indiana variety, introduced by Albertson & Hobbs, of Bridgeport, Indiana. Claimed to be more prolific, with fewer seeds, and sweeter than any other currant ; clear, bright red, about the size of Victoria, easily picked, and hangs a long time on the bushes.

Prince Albert.—Described as vigorous, even more upright than Red Dutch, and a very heavy yielder, though a weak grower when young. Bunches short to medium. Fruit medium to large, rather pale red, of poor quality, ripening late. One of the most profitable varieties, and popular at canneries. Said to retain its foliage late like the Long-Bunched Holland.

Red Cross.—Received at the Geneva (N. Y.) Exp. Station from Jacob Moore, of Attica, N. Y., who states that it is a cross between Cherry and White Grape. Described as vigorous and upright. Bunches of medium length. Fruit medium to large, of good color, somewhat lighter than Cherry, milder, though more acid than White Grape. Season somewhat later than Cherry. Controlled by the Green Nursery Company of Rochester, N. Y.

Red Dutch (Large-Bunched Red, Long-Bunched Red, Morgan's Red, Groseillier Rouge à Grosse Fruit).—Meehan* also gives the

*Gar. Month. 1876: 209.

following list as synonyms of this variety: Fertile, Fertile d'Angleterre, Fertile de Palluau, Fertile de Bertin, La Hative, Hative de Bertin, Bertin No. 9, Belle de St. Gilles, Chenonceaux, Grosse Rouge de Boulogne, Queen Victoria, and Red Grape. One of the oldest and best known varieties. It is still retained by some growers in the West, and perhaps elsewhere, as more valuable than any of its younger competitors. A strong grower, rather tall, upright, with comparatively slender shoots, productive. Fruit of fine color and sprightly flavor, but not large.

Red Grape.—Mentioned by Fuller as having foliage not shining, as with the Red Dutch.

Ruby.—Raised by Jacob Moore, the originator of the Brighton Grape, from seed of the Cherry believed to have been crossed by White Grape. Described as not equal to Versaillaise or Cherry in size, but with larger bunches and better fruit; productive. Professor Troop, of Indiana, reports it as decidedly the best currant they have.

Select.—Said by T. T. Lyon to lack in vigor and productiveness.—Mich. Exp. Sta. Bull. 118: 20.

Short-Bunched Red.—Mentioned by Downing as much like Red Dutch, with shorter bunches.

Stewart ('*s* Seedling).—A Minnesota variety, mentioned as not having received its share of notice. Said to be the handsomest in bush and berry of any variety grown in that state. A vigorous, upright grower, prolific and hardy. Fruit somewhat hidden by the leaves, large, borne in good sized bunches, remaining a long time after ripening without injury.—Ann. Rept. Minn. Exp. Sta. 1888: 235.

Storrs & Harrison Co.'s No. 1.—Received at the Geneva (N. Y.) Experiment Station for trial from Storrs & Harrison Company. Described as moderately vigorous, upright. Bunches of medium size. Fruit small to medium, much like Red Dutch in color, but less acid.—Bull. 95: 422.

Striped Fruited (Silver Striped).—An old German variety. Mentioned by Downing and Fuller as being distinctly striped, but small, a poor bearer, and of no value except as a curiosity.

Transparent (Transparent White, Transparent Blanc).—A French variety mentioned by Downing and Fuller. Said to be a seedling of the White Grape, and to resemble that variety so closely as to be practically identical.

Versaillaise (*La*) (Versailles, Macrocarpa, Fertile d'Angers, La Caucase, Caucasian). Originated by M. Bertin, of Versailles, from seed of the Cherry currant, and so similar to that variety that it has frequently been confounded with it. As grown at the

Geneva (N. Y.) Experiment Station, it is less productive than the Cherry, with rather darker fruit, though generally regarded as more productive. The tendency of the shoots to "go blind," that is, to lack either the terminal buds or those near the tip, is said to be less common with this variety than with the Cherry. This is one of the best known market currants, and very generally prized. E. P. Powell says* that the true Versaillaise is not unlike Fay in size and color, a rather more upright grower, with a long, fine stem, enormously productive. Flavor almost like Fay.

Victoria (May's Victoria, Goliath, Raby Castle, Red Grape, Houghton Castle, Wilmot's Red Grape). Said to have been known in Hexham and New Castle as the Houghton Castle currant. Sent from there to Raby Castle, whence it was procured by Mr. May, of Leaming Lane, and advertised by him as May's Victoria. One of the most reliable red currants known. Described as a very strong grower, upright, very productive. Professor Beach says†: "The buds have a peculiar grayish color, quite characteristic of this variety, as is also the cluster of well formed buds at the end of the shoot." Foliage rather pale green. Fruit bright red, medium or above in size, mildly acid, late in coloring, but will keep on the bushes in good condition later than either Cherry or Red Dutch. Less liable to attacks of the currant borer than most other sorts. This variety, the Long-Bunched Holland and Prince Albert seem to belong to a somewhat distinct class, being able to retain their leaves and fruit better than most sorts.

Warner's Red Grape, Warrior's Grape.—English varieties mentioned in Tilton's Journal of Horticulture, Vol. 9, p. 188. Perhaps synonyms of other sorts.

White Dutch (White Crystal, White Clinton, Reeves' White, Morgan's White, White Antwerp, White Leghorn, Clarke's Sweet, White Holland, White Pearl). Very similar to Red Dutch in habit. Bush vigorous, upright and productive. Fruit variable in size, translucent, slightly darker than White Grape, mildly acid; quality excellent, very rich and sweet. A well known old sort.

White Grape (White Antwerp, Imperial White[?], Imperial Blanc).—Probably the best known and finest white currant grown. Described as moderately vigorous, rather slender, somewhat spreading, productive. Bunches long, berries quite uniformly large, translucent, whitish, attractive, mild in flavor and of fine quality. E. P. Powell says* that it was long before he secured the genuine White Grape. This he considers to be absolutely the

*Gar. and Forest 7: 188.

†Geneva (N. Y.) Exp. Sta. Bull., 95: 424.

finest white currant grown. The fruit is large, handsome, clear in color, entirely unlike the creamy color of the more common so-called white currants.

White Imperial.—A variety strongly recommended by S. D. Willard, of Geneva, N. Y. Said to be by far the sweetest currant known, the difference in that respect being like that of the sweet and sour cherry. Clusters and berries of good size.

White Pearl.—Mentioned and described, in Hovey's Magazine, Vol. 17, p. 217, as raised by Remi Wilquet near Brussels. Perhaps not introduced in America. Fuller gives this name as a synonym of White Dutch.

White Provence.—Mentioned by Downing, Prince, and Fuller. Said to be a strong, upright variety, with leaves more or less silvered at the edge. Fruit large, yellowish white. Not so productive as White Grape, though one of the most vigorous white varieties grown.

White Versaillaise.—Said to have been raisen by M. Bertin, of Versailles, France. At the Geneva (N. Y.) Experiment Station it is vigorous, upright, easily picked. Bunches long ; berries large, slightly darker than White Grape.

Wilder.—A seedling of the Versaillaise which originated about twenty years ago with E. Y. Teas, of Irvington, Ind., who named and disseminated it to a limited extent. Later the stock was sold to S. D. Willard, of Geneva, N. Y., who catalogued it as "President Wilder." Said by him to be the most productive currant which he has tried. Described as vigorous, upright. Fruit large, but not so uniform as Fay, of fine color, lighter than Fay, remaining bright and attractive until very late in the season. Flavor mild, quality good. Very promising, giving evidence of coming to be a standard (Fig. 68).

Many of the varieties mentioned in this list doubtless should be placed as synonyms. Others may have only received mention or have been little known in the United States. No attempt has been made to include European varieties unless they are known to have received attention here. The following were mentioned as English varieties in Tilton's Journal of Horticulture, Vol. 9, p. 220: Bang Down, Lander's New Red, Great Eastern, and Garibaldi.

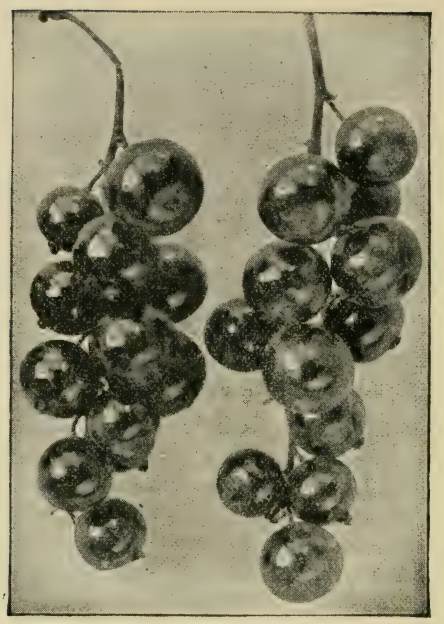

Fig. 68. Wilder. (Natural size, medium cluster.)

EUROPEAN BLACK CURRANTS

(Ribes nigrum)

Baldwin.—Described as moderately vigorous and productive. Fruit variable, averaging medium. Flavor milder than that of the Common Black, ripening several days later.

Bang Up.—Mentioned by Downing as a variety similar, and in no way superior, to the Black English.

Black Grape (Ogden's Black Grape).—A vigorous grower, but unproductive. Fruit variable, strong flavored.

Black Naples.—One of the best known English sorts. Vigorous, moderately productive. Fruit variable, strong flavored. Downing says it blooms earlier than the Common Black, but ripens later (Fig. 69).

Brown-Fruited (Green-Fruited, Russian Green).—An English variety having the wood, foliage and growth of the Common Black, with greenish brown fruit when ripe. Berries dry, hard, rank flavored and worthless.

Champion.—Described as of dwarf, upright habit, fairly produc-

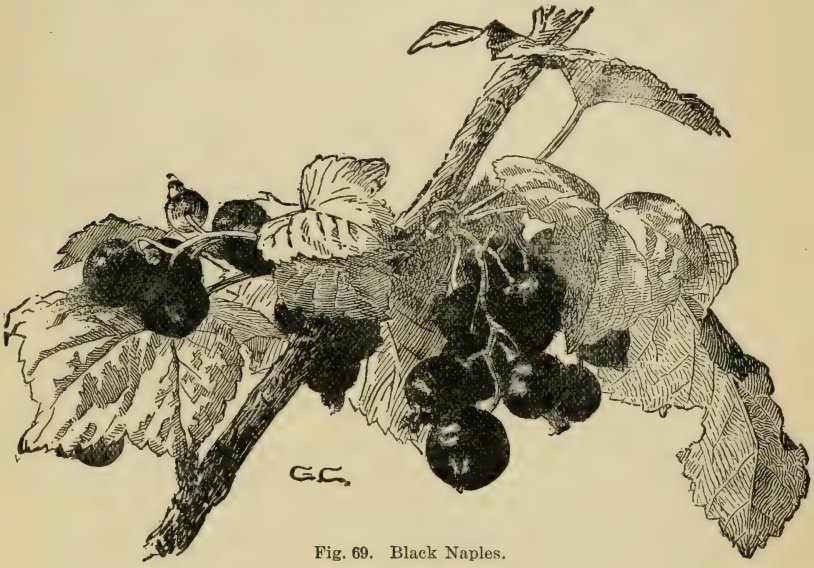

Fig. 69. Black Naples.

tive. Fruit of large size, borne in short clusters, mild flavored, and more desirable than the Common Black.

Common Black (Black English).—Described as vigorous and productive, of spreading habit. Fruit medium to large, the clusters ripening evenly. Pulp rather acid and strong flavored.

Dwarf Black.—Mentioned in the Horticulturist for 1854, p. 162, as of more dwarf habit than the other blacks, with bunch and berry equal to Black Naples.

Lee (Lee's Prolific).—Bush dwarfish, moderately vigorous, productive. Fruit rather brighter in color than most kinds, but not much of an improvement, if any, over the Black Naples.

Prince of Wales.—Origin Ontario. Bush vigorous and produc-

tive, giving the highest yield of all black currants at Geneva, N. Y. Fruit variable in size, milder in flavor than the Common Black, nearly sweet when fully ripe.

Saunders.—Originated by William Saunders, of Ontario. Described as vigorous and productive. Variable in size, rather mild. Fairly well disseminated and promising in Canada. Another variety originated by Professor Saunders, and received at the Geneva (N. Y.) Exp. Station as Saunders's No. 2, is reported to have little value.

THE GOLDEN OR BUFFALO CURRANT

(*Ribes aureum*)

Crandall.—The best known variety of this species at the present time, although the plants sent out under that name differ so much that they are supposed to have been only seedlings. Like the forms found in unnumbered door-yards, and every where known as the Flowering Currant, this is a tall, vigorous, upright bush. Although apparently productive, the average yield per bush at the Geneva (N. Y.) Experiment Station for three years was less than one pound. The fruit has a tough skin and such a peculiar flavor that it is little prized.

Deseret.—Another named variety of this species. Mentioned by Fuller, who says it is highly valued by the Mormons of Salt Lake City, whence he received it.

Golden.—Apparently a variety of the western representative of this species, *Ribes tenuiflorum*, since it is described by Fuller as "large, round, deep golden yellow, very acid, and slightly bitter. Flowers yellow. Of no value for its fruit, but might be improved. Native of the Rocky Mountains and a variety of *Ribes aureum*."

Jelly.—Received at the Geneva (N. Y.) Experiment Station from R. H. Blair & Company, Kansas City, Mo., being selected plants of this species obtained in western Kansas. Found to be of larger size and more productive than Crandall.

This species has often been known under the name Missouri Currant. It has also appeared at times under other names, such as Utah, Utah Hybrid, etc.

THE AMERICAN BLACK CURRANT

(*Ribes Americanum*)

This species is almost unknown in cultivation, yet Fuller mentions one variety under the name Sweet-fruited Missouri, which he describes as large, black, roundish ovoid. Bunches small,

containing few berries of sweet, musky flavor. He says that it is a slight improvement upon the common wild black currant, which may be fonnd in almost any low, moist woods.

RECOMMENDED VARIETIES

For a general-purpose currant, the Victoria is probably most popular. The Red Dutch is too small, but succeeds well on the Plains. Cherry and Versailles are standard varieties for large size. Fay is to be recommended when given extra good care. Prince Albert is very productive, and excellent for jelly and canning; very sour. Wilder is one of the most promising recent varieties. White currants are little grown for market. For dessert use, White Imperial is best, but White Grape is the most popular variety.

Beach makes the following summary of varieties of currants:*

"The yields of the red currants at this station that are in full bearing may be compared by consulting the following table, which shows the average yield per plant in pounds for the last three seasons combined:

Name	*Average yield per plant*
Cherry	5.15
Fay	4.70
Gloire des Sablons	2.07
London Red	7.14
Prince Albert	8.86
Victoria	6.25

"It appears from this table that for this locality, at

*Bull. 25, N. Y. State Exp. Sta.

least, the Cherry is superior to Fay in productiveness, and it still holds its place as one of the most desirable of the large-fruited red currants for the commercial grower. Fay yields the longer bunches, more uniformly large fruit, and its fruit is more easily picked than Cherry, but it does not make as satisfactory a bush nor give as satisfactory a yield. Both these varieties need to be marketed comparatively early. They will not remain on the bushes in good condition for shipping as late as will Victoria, Prince Albert or Wilder. As to the comparative value of different varieties for jam and jelly, Curtice Brothers Co., Rochester, N. Y., who operate a very extensive establishment for preserving and canning fruits, write us that Cherry currant is preferred for jam because it is thin-skinned and juicy; but not so for jelly making, for the reason that it is necessary to evaporate away more of its juice to produce jelly than it is with some other varieties. The currant that is preferable, they say, is the largest one that has a thin skin and is filled with rich juice or pulp, and they believe this is true of Fay and Prince Albert above other varieties. London Red, also called Short Bunched Red, is objectionable, on account of its short clusters and fruit close to the wood, but has the merit of being one of the most productive of the red kinds that have been tested here. It ripens about with Red Dutch. The Red Dutch was not included in the above list, because the bushes under test were unsatisfactory. It is one of the best of the mid-season, medium-sized red currants. Prince Albert and Victoria are both valued as productive late currants. The

former, when well grown, will pass for a large currant. The fruit is paler and less attractive than Cherry. Victoria is a good late currant, but it ranks only medium in size. Prince Albert was the most productive during the last three years of all the kinds thus far tested, having an average yield during the last three years of 8.86 pounds per bush. White Dutch was the most productive of the white, and Prince of Wales the most productive of the black kinds tested. Individual varieties in the different classes vary much in productiveness, but the most productive black currants do not equal in yield the most productive red or white kinds. It is estimated that on account of their being less productive, one would need to realize from one and a half to two cents per pound more for the black as a class, than for the red or white currants."

CHAPTER XV

VARIETIES OF GOOSEBERRIES

The gooseberries cultivated for fruit nearly all belong to two closely related species, *Ribes grossularia* of Europe and *Ribes oxyacanthoides* of North America. These species are so much alike that if we were accustomed to take a broader view of the plants of the world and the influences which affect them, we might easily consider them a single species, and their differences due to climate and location rather than to inherent characteristics. As elsewhere stated, the horticultural differences are more marked than the purely botanical differences. The European species has been long in cultivation and its fruit greatly improved, at least in size and appearance, while the American, being young in cultivation, is far behind in size, though superior in quality. The English varieties all have a thick, rough skin, that detracts from their value, and they are even more sour than our own. The susceptibility of English varieties to mildew, which has been the chief cause of their failure in the United States, is really the most prominent distinction between the two species at the present time. The European type is essentially a stocky and close grower (Fig. 70), whereas the American type is a slender and open grower (Fig. 71).

Fig. 70. Industry, the European type.

Fig. 71. Pale Red, the American type.

HISTORY AND FUTURE

Like the currant, the gooseberry appears not to have been known to the ancients, and it is uncertain when it first began to receive garden culture. Although long common among the hedges and woods of England, it is thought by most authors not to have been indigenous. It is reported, as first mentioned by British authors, about the beginning of the sixteenth century. Geo. W. Johnson* states that Tusser, in his "Five Hundred Points of Good Husbandry," published during 1557, mentions the gooseberry as then among garden fruits. Johnson's edition of Gerarde's Herbal, published in 1636, says: "There be divers sorts of the gooseberries, some greater, others lesse; some round, others long, and some of a red color. * * * The sorts of gooseberries are these: the long greene, the great yellowish, the blew, the great round red, the long red, and the prickly gooseberry." The further statement is made that "These plants doe grow in London gardens and elsewhere in great abundance." Under the heading of names, the statement is that "this shrub hath no name among old Writers, who as we deeme knew it not, or else esteemed it not; the later writers call it in Latine, Grossularia, and oftentimes of the berries, *Uva Crispa*, *Uva spina*, *Uva spinella*, and *Uva Crispina;* in French, Groiselles; in English, Gooseberry, Gooseberry bush and Fea-berry bush in Cheshire, my native country." This latter name was also known in other parts of England, being abbreviated into Feabes or Fapes in some

*The Cucumber and Gooseberry, p. 103.

localities. Most authors have thought that the name gooseberry was derived from the fruit having been first used as a sauce with "green goose." Others doubt this. Geo. W. Johnson says:* "It is somewhat unfortunate for this derivation that it has never been so used. It seems to me more probable to be a corruption of the Dutch name Kruisbes, or Gruisbes. Kruisbes, I believe, was derived from Kruis, the Cross, and Bes, as Berry, because the fruit was ready for use just after the Festival of the Invention of the Holy Cross; just as Kruis-haring, in Dutch, is a herring caught after the same festival."†

Loudon states‡ that the first marked improvement in size was made by the Dutch. But its present remarkable development has been brought about largely by the efforts of the Lancashire weavers. The production of new varieties, and the increase in size, has been greatly stimulated by the annual shows or "gooseberry prize meetings," at which liberal prizes are offered for the largest fruits. The results of these are published in the Gooseberry Annual, now forming an extensive set. At the beginning of the century the largest fruits seldom exceeded 10 dwts. in weight, but in recent years they frequently exceed 30 dwts. Size is not the only quality sought; some sorts are prized for their flavor, some for their beauty, and others for their productiveness. There is also a wide diversity in the season of ripening among different sorts.

*l. c. 109.

†An excellent early account of the gooseberries, with colored plates, is Thory's "Monographie on histoire naturelle du genre Groseillier," Paris, 1829.—L. H. B.

‡Arboretum et Fruiticetum, 2: 973.

The history of the American gooseberry in cultivation began with the Houghton, which was raised from seed of a wild plant by Abel Houghton, of Lynn, Mass., in 1833. It is significant that the most reliable American sort, and the one most generally cultivated at the present time, is but one generation removed from this, being a seedling of it.

What the gooseberry of the future will be no one can say, but it is certain to be largely what we make it. It seems safe to predict that it will not come from England. Adaptability to climate, with consequent resistance to disease, and quality of the fruit, are in favor of American species. We have given the gooseberry too little attention, and much of that has been on the wrong basis in trying to develop seedlings of the English varieties. The gooseberry as now grown is objectionable on account of its thorns. Yet there are forms comparatively free from these uncomfortable additions, and careful, persuasive treatment ought to induce the plants to relinquish them altogether. An English variety has been recently introduced which is said to be thornless. The fruit of our species is, in most cases, perfectly smooth, while that of the English gooseberry is roughly pubescent, if not hairy or prickly also.

There are at least three other species, *Ribes Cynosbati*, *R. rotundifolium* and *R. gracile*, which might well receive attention in the way of selection and crossing, with a view to future development. All have good points to recommend them. The fruit of *Ribes Cynosbati* is commonly much larger than that of *R. oxya-*

canthoides, in the wild state, and while generally prickly, is often smooth. The fruit of *R. rotundifolium* is small but agreeable, and the plants are very productive, while *R. gracile* is found all over the Plains, and is, therefore, well adapted to that region.

AMERICAN GOOSEBERRIES

Chiefly Ribes oxyacanthoides

The American varieties have vigor, hardiness, ease of propagation, and superior quality to recommend them, being inferior only in size, which must steadily improve as selection and breeding go on.

Apex.—A variety from Oregon. Said to be a native seedling, though somewhat resembling the European type in growth and general appearance.—T. T. Lyon, Mich. Exp. Sta. Bull. 118:23.

Champion.—Said to have originated with O. Dickinson, Salem, Oregon. Plant upright, prolific. Fruit large, uniform, transparent, with tender skin. Said to endure neglect well, and to be an excellent shipper. Popular in Indiana.

Downing.—The great American gooseberry. More widely grown and more generally prized than any other known sort. Originated by Charles Downing at Newburg, N. Y., from seed of the Houghton. Pure seedlings of this variety grown at the Geneva (N. Y.) Experiment Station, while not generally closely resembling the parent, seem, in some cases, to indicate a mixture of foreign blood, so that Professor Beach is led to consider this a hybrid between the American and European gooseberry. Downing describes it as upright, vigorous and productive. Fruit somewhat larger than Houghton, roundish oval, whitish green, with the rib-veins distinct. Skin smooth; flesh rather soft, juicy, very good. Excellent for family use. It has seldom mildewed in the United States, and succeeds over a wide area. Houghton is said to be sometimes sold for this variety because more easily propagated. The fruit must be picked very soon after reaching full size, for it ripens quickly and becomes too soft for handling or shipment. In quality it is superior to the European varieties, and surpassed by few, if any, native sorts.

Excelsior.—Received at the Geneva (N. Y.) Experiment Station from J. H. Haynes, of Delphi, Indiana, with whom it originated. A strong grower; fruit light green, roundish, smooth.

Hobbs Seedling.—A variety mentioned by Downing. Thought to have been originated by O. J. Hobbs, of Randolph, Pa. Described as light pale green, roundish, slightly oval, of medium firmness, a good keeper, and nearly one-half larger than Houghton.

Houghton.—Grown from seed in 1833 by Abel Houghton, of Lynn, Mass., who planted Crown Bob, White Smith, White Rock and Red Champion, with a native plant from the woods in the center. One plant only was saved, the Houghton. This was the first American variety introduced, and is still one of the best flavored, most hardy and productive, though too small. It is generally regarded as a pure native, but the account of its origin, and experiments made at Geneva, N Y., by growing seedlings from two of its seedlings, Smith and Downing, indicate that it is a hybrid between the American and European species. The bush is rather slender and drooping in habit. The fruit small, handsome, dark red, with a whitish bloom, thin skinned, smooth, juicy, sweet, and of excellent quality.

Hudson.—Raised by Joseph H. Ricketts, and said to be of fine quality, larger than Downing, free from mildew. Its style of growth and freedom from mildew led him to think it was an American or a cross-bred variety. Foliage thick and glossy, but liable to drop some before the fruit is past. Hard to propagate.—Gar. Month. 1880:303.

Jewett.—Received at the United States Division of Pomology from George H. Andrews, Clarkson, N. Y. A chance seedling found in a pasture. Described as large, oblong, whitish green, changing to blotched and stippled red. Seeds numerous, large, light brown. Flesh purplish. Pulp moderately firm, juicy, subacid, rich; season early.—Report of the United States Pomologist 1894:27.

Orange (Engle's Yellow ?).—Said to ripen seven to ten days earlier than other sorts. Described as a strong grower on almost any soil, but needs heavy pruning. A good bearer. Fruit about the size of Houghton, rich golden yellow, fine flavored and very sweet.

Pale Red (American Red, American Seedling, Robert's Sweetwater, Ohio Seedling, Dutch Joe, Ohio Prolific, St Clair [American] Cluster.)—A variety of unknown origin which has long been in cultivation. Frequently known as Cluster or American Cluster. It appears to be of pure *Ribes oxyacanthoides* parentage. The bush is a strong grower, with slender wood, very productive.

Fruit small or medium, darker in color than Houghton, tender, sweet and good. One of the oldest cultivated varieties.

Pearl.—Originated with Professor William Saunders, of London, Ont., who gives its parentage as Downing crossed with an English variety known as Aston's Seedling. This latter name, however, appears to be a synonym of Red Warrington. The variety resembles Downing so closely, both in bush and fruit, as to be practically indistinguishable, although at Geneva, N. Y., it has proved less productive.

Red Jacket.—A variety originated more than twenty years ago by Professor William Saunders, of London, Ont. Named and introduced by George S. Josselyn, of Fredonia, N. Y., who thinks that it was a seedling of Houghton crossed by Red Warrington, which would make it a hybrid between *Ribes oxyacanthoides* and *Ribes Grossularia.* It is a strong grower and productive, somewhat larger and a better shipper than the Pearl, though not quite so good a cropper. The fruit is large, roundish or elongated, reddish green shading into red, smooth, quite transparent when ripe ; skin rather tender. Flesh juicy, rich, fragrant, of good quality.

Smith.—Originated by Dr. Smith, of Windsor, Vt., from seed of the Houghton. Professor Beach, of Geneva, N. Y., says* that, like that variety, it shows indications of being a hybrid between the American and European species. Seedlings of Smith crossed with Pale Red, which is thought to be a pure American variety, have occasionally shown marked European characteristics, while none of the pure seedlings of Pale Red have ever given such indications. It is described as a vigorous grower, with somewhat curving canes and slender branches. Foliage firmer and more leathery than that of Downing, with a more glossy surface. Fruit dull, pale green, sometimes spotted with red, and having a light bloom. Skin smooth, thin. Pulp sweet and good.

Strubler.—Seedlings originated by Phil. Strubler, of Naperville, Ill., have been sent out under this name, with different numbers attached. Nearly all of them are seedlings of Downing or Smith. They are described by Professor Beach, in Bull. 114 of the Geneva (N. Y.) Experiment Station, and have also been mentioned in reports of the United States Pomologist.

Tree.—A variety mentioned by T. T. Lyon, in Mich. Exp. Sta. Bull. 118 : 23, as apparently a native. Vigorous, healthy, with red fruit.

Victoria.—Mentioned in the Gardener's Monthly for 1870, p. 156, as a small, smooth variety. Thorns not numerous, but sharp,

*Bull. 114:19.

inclined to bend over. This description would seem to indicate an American variety.

Hybrids or Unclassed Varieties

Cedar Hill.—A variety mentioned in the report of the U. S. Pomologist for 1891, p. 394, as received from Dr. A. W. Thornton, West Ferndale, Washington, with whom it originated. Described as a large, oval berry, with long, adhering flower parts, and a few scattering prickles. Skin thin. Pulp quite rich. Said by its originator to be an upright grower, of good size, very prolific, as much so as Champion or Houghton. Perfectly mildew proof in Washington. The clause "with long, adherent flower parts, and a few scattering prickles" would seem to indicate that this may be a seedling of some western species.

Crystal.—Received at the Geneva (N. Y.) Experiment Station from J. M. Ogle, of Puyallup, Wash. Professor Beach says* that this variety appears to be a hybrid between the European gooseberry and some American species, possibly *Ribes Cynosbati*, its European parentage being indicated by the general appearance and character of the fruit, which is pubescent, like the European varieties. Its canes, however, are tall and slender, and the leaves thin, the buds, too, being shorter than those of *Ribes Grossularia*. He reports it as the most productive variety on their grounds during a period of four years, but hardly desirable, owing to its dull green color and poor flavor. The fruit is slightly larger than Downing, but rather soft when ripe.

Hale Golden.—Mentioned in The Rural New-Yorker, 1897, p. 646, as on trial at the Rural grounds.

Mountain.—A variety which originated with the Shakers, of Lebanon, N. Y. Bush tall and productive, with slender, sprawling branches, which need close pruning. Fruit dull, brownish purple, somewhat larger than Downing, oblong, smooth, with a thick skin, moderately juicy and sweet. Professor S. A. Beach says† that this variety is of special interest, as being the only known representative of *Ribes Cynosbati* which has found its way into cultivation, being clearly a hybrid between this and a European species. The long, slender, solitary spines, the tall canes, sprawling branches, dull brown purplish color of the fruit, and the very dark green pulp are like Cynosbati, as are also the beautiful brown and red color of its autumn foliage which is quite unlike the yellow or occasional brown tints of the European kinds. The

*Geneva (N. Y.) Exp. Sta. Bull. 114:16.

†Geneva (N. Y.) Exp. Sta. Bull. 114:18.

fruit is very large for an American variety, and its thick, smooth skin indicates foreign parentage, the fruit of Cynosbati having a thin skin usually beset with prickles The glossy upper surface, and somewhat leathery texture of the foliage, and comparative short, thick, buds are also inherited from the European parent, Cynosbati having slender buds, with soft, pubescent leaves, neither leathery nor glossy.

Newell Seedling.—A variety mentioned in the Report of the Illinois Horticulture Society for 1890, p. 59, as on exhibition in a preserving solution. Said to be large, of fine appearance, hardy, and free from mildew. Nothing is given which would indicate its parentage.

Oregon Jumbo.—A variety offered by the J. T. Lovett Company, of New Jersey, and described as "monstrous, and excelling all others. Superb in appearance and flavor. Vigorous, productive, hardy, and reliable. Fruit smooth, pale green, of high quality." This description does not make clear its parentage.

Stein.—Mentioned in The Rural New-Yorker, 1897, p. 646, as "a cross between Houghton and an old German variety."

ENGLISH GOOSEBERRIES

Ribes Grossularia

The subjoined list includes only those English varieties which are, or have been, most prominently known in the United States, following chiefly those which are mentioned by Professor S. A. Beach, of the Geneva (N. Y.) Experiment Station, in his Bulletin No. 114, as most promising. Gooseberries, and especially the English varieties, have received much attention at this station. The opinions of Professor Beach are, therefore, worthy of especial consideration. Lindley's "Guide to the Orchard," published in 1830, enumerates nearly one thousand varieties, and many more have been produced since then. Some of these have found their way across the water and have appeared in the United States, usually only to suc-

cumb to that inveterate enemy, mildew, and pass into oblivion. To attempt to describe all these varieties would be as futile as useless.

Blucher.—Grown at the Geneva (N. Y.) Experiment Station, and described as very large, dark red, oblong or roundish oblong, nearly smooth,* with thin skin, sweet, of very good flavor. Bush

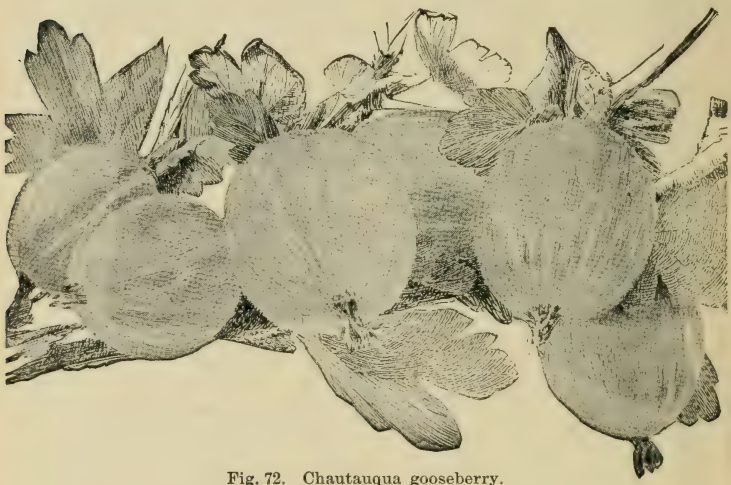

Fig. 72. Chautauqua gooseberry.

a strong grower, apparently productive, with but little mildew. Worthy of trial.

Chautauqua.—Introduced by Lewis Rœsch of Fredonia, N. Y., being a chance seedling found in a garden in Dunkirk, N. Y. Said to be a vigorous grower and generally healthy, though sometimes mildewing. Fruit large, roundish oblong, smooth, pale green, of best quality. A promising variety for home use, though somewhat lacking in productiveness (Fig. 72).

*The term "smooth," as used in describing English gooseberries, should be understood to mean free from hairs, for the skin of these varieties has a roughness to the touch quite different from that of the American varieties.

Fig. 73. Columbus gooseberry.

Columbus.—Introduced by Ellwanger & Barry, of Rochester, N. Y. A strong grower, comparatively free from mildew. Fruit large, oblong or roundish oblong, white or greenish yellow, sweet, of best quality. Possibly the same as Triumph (Fig. 73).

Crown Bob.—A variety long known in England as desirable either for home use or market. Bush dwarfish, but vigorous and productive. Fruit medium to large, nearly round, dark red, nearly smooth, almost sweet, of good quality, similar to Industry in color, but somewhat smaller; quite subject to mildew, less

vigorous and less productive than Industry. It was figured in Volume I of the Horticulturist, p. 449.

Dominion.—Received at the Geneva (N. Y.) Experiment Station from E. C. Pierson of Waterloo, N. Y. Described as vigorous and promising. Fruit large, pale greenish white, nearly transparent, with a thin skin for fruit of this class, sweet, and of good quality.

Excellent.—Promising at the Geneva (N. Y.) Experiment Station. A strong grower, somewhat subject to mildew. Fruit medium to large, round and nearly smooth, light red, sweet, very good.

Frontenac.—Received at the Geneva (N. Y.) Experiment Station from H. S. Anderson, of Union Springs, N. Y. Said to be a strong grower. Fruit large, oblong, smooth, pale green, sweet, good.

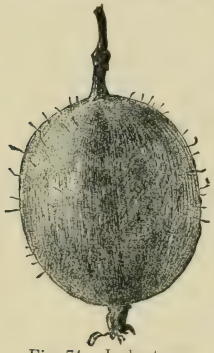

Fig. 74. Industry.

Gracilla.—Mentioned in The Rural New-Yorker, 1897, p. 646, as a promising variety of the English type received from L. H. Hoysradt, Pine Plains, N. Y., in the spring of 1895.

Hedgehog (Improved Early).—A vigorous grower, productive, comparatively free from mildew. Fruit below medium size, nearly round, somewhat hairy, yellowish green, sweet, of fair quality.

Huntsman.—Said to be a strong grower, and apparently productive, comparatively free from mildew. Fruit medium to large, oblong, smooth, pale green, sweet, good.

Industry (Whinham's Industry).—One of the best known and generally successful European varieties. Vigorous, productive, somewhat subject to mildew. Fruit medium to large, varying from pear shape to roundish oblong, smooth, or with very few minute prickles, dark red, mild subacid or sweet, of good flavor. Said to be very hard to propagate in the United States. George S. Josselyn says:* "All the Industry plants I have ever seen were started in Europe." This, he thinks, is a strong indication that it is not adapted to our climate. (Fig. 74.)

Jolly Angler.— Vigorous, and apparently productive. Fruit medium to large, oblong or roundish oblong, smooth, light green, sweet, good.

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*The Rural New-Yorker, 1896:575.

Keepsake.—A strong grower, promising to be productive, somewhat subject to mildew. Fruit medium or above, nearly round, smooth, greenish white, sweet or nearly so, very good.

Lady Popham.—A moderate grower, productive, comparatively free from mildew. Fruit medium to large, oblong, smooth, yellow, very sweet, good. A good variety for exhibition purposes.

Lancashire Lad.—A strong grower, comparatively free from mildew. Fruit medium to large, nearly round, dark red, almost wine color, slightly hairy, of good quality, subacid or nearly sweet.

Leveller.—A moderate grower, mildewing but slightly, and promising to be productive Fruit medium to large, oblong, smooth, yellowish, slightly acid, good.

Lord Beaconsfield.—A good grower, promising to be productive, somewhat subject to mildew. Fruit below medium size, nearly round, green, smooth, sweet and good.

Matchless.—A strong grower, promising to be productive, mildewing but slightly. Fruit large, oblong, green, slightly hairy, sweet, very good.

Portage.—A variety received at the United States Division of Pomology from A. H. House, Mantua Station, Ohio. Described in the report for 1891, p. 395. Also described, and illustrated by a colored plate, in the report for 1894. Said to be a chance seedling found in 1874. Fruit solitary, evenly distributed, large to very large, oblong oval ; surface moderately smooth, dull, slightly downy, with an occasional prickle. Color yellowish green, with bronze dots near stem, and a long suture on some specimens. Flesh translucent, greenish, quite firm ; pulp melting, moderately juicy. A good shipper. Flavor mild subacid, rich, quality good.

Puyallup (Puyallup Mammoth).—The original bush is said to have been dug in 1881, at an old Indian camp on the bank of the Puyallup River, one mile below the town of that name, by W M. Lee and his wife, of Tacoma, Wash. Introduced by J. M. Ogle, in 1887. Said to be a fairly strong grower, rather late in ripening. Fruit large, pale green, smooth, sweet, of good quality. Mentioned in the Report of the U. S. Pomologist for 1891, p. 395, as apparently identical with Triumph, but Prefessor Beach considers this an error.

Queen of the Whites.—A strong grower, comparatively free from mildew. Fruit of medium size, nearly round, smooth, pale yellowish green, sweet, good.

Red Champagne.—A strong grower, comparatively free from mildew. Fruit small to medium, nearly round, slightly hairy, dark red, sweet, and good. This variety was recommended by the American Pomological Society in 1850.

Red Jacket.—An English variety, entirely distinct from the American Red Jacket. Not a strong grower, but promising to be productive and comparatively free from mildew. Fruit large to very large, and often narrowed toward the stem.

Red Warrington (Aston Seedling).—A strong grower, comparatively free from mildew. Fruit medium to large, oblong, delicate pale red, hairy, sweet, of best quality. Recommended by the American Pomological Society in 1850. Also mentioned in the Horticulturist, Vol. II, p. 341, as the best kind, both in Canada and in England. Said to ripen late and to hang long on the bushes without injury.

Smiling Beauty.—A good grower. Fruit medium to large, nearly round, greenish yellow, sweet, of best quality.

Spineless. Recently introduced in the United States, by C. H. Joosten, of New York City. It is figured in the Gardener's Chronicle for July 27, 1895, which says: "They are spineless varieties obtained from seed. The first spineless gooseberry, according to the Revue Horticole, 1892:180, was obtained as a chance seedling by M. Billard about 1860. About 1884, M. Ed. Lefort sowed the seeds of this variety, from which he obtained a race of spineless varieties, several of which are described in the Revue Horticole, as above cited. The variety we figure is a dwarf form, very productive, and with fruit of good flavor. It is the form described and figured by M. Carrière and Madame Edouard Lefort. The varieties are grafted upon *Ribes aureum*, but the scions soon become free." Whether this desirable novelty will achieve any degree of success in the United States remains to be seen.

Stockwell.—A moderate grower. Fruit medium to large, oblong, smooth, light green, sweet, good.

Succeed.—A fair grower, promising to be productive, and comparatively free from mildew. Fruit medium to large, oblong, smooth, yellowish green, sweet, good.

Sulphur (Early Sulphur).—A strong grower, comparatively free from mildew. Fruit of medium size, round, nearly smooth, fine yellow color, sweet, good. Placed on the list of the American Pomological Society in 1850.

Sunset.—A strong grower, comparatively free from mildew. Fruit medium to large, oblong, nearly smooth, yellowish green, sweet, of best quality.

Tally Ho.—A strong grower, comparatively free from mildew. Fruit medium to large, pear-shaped, pale green, nearly smooth, sweet, good.

Thumper.—A moderate grower, promising to be very productive. Fruit medium to large, oblong, smooth, light green, sweet, good.

Triumph.—A strong grower, comparatively free from mildew, productive. Fruit large, oblong or roundish, pale yellow, sweet, smooth, good. This variety has received strong commendation from various sources. Mentioned at the meeting of the Western New York Horticultural Society in 1892, as very promising, a stronger grower than Industry and equally productive. In the

Fig. 75. Whitesmith.

report of the American Pomological Society for 1889, p. 120, E. Williams says that it is a great improvement on any other variety that will grow in our climate.

Wellington Glory.—The most productive European gooseberry grown at the Geneva (N. Y.) Experiment Station. A strong grower, comparatively free from mildew. Fruit attractive in appearance, medium to large, oblong, smooth, with slight bloom, pale yellow, nearly white, sweet, of very good quality.

White Eagle.—Bush a moderate grower, promising to be productive. Fruit medium to large, oblong, pear-shaped, smooth, greenish white, sweet, good. This variety was exhibited before the Pennsylvania Horticultural Society in 1853.

Whitesmith (Woodward's).—A strong grower, somewhat subject to mildew, productive. Fruit medium to large, nearly round,

smooth. Skin thin and tender for an English sort, pale yellowish green. Pulp sweet, very good. This variety has been long known in the United States. It was recommended both by the New York Agricultural Society and the American Pomological Society in 1850. It was figured in the Horticulturist, Vol. I, p. 448, where it is said to be quite as good among the whites as Crown Bob among the reds (Fig. 75).

English Varieties Mentioned, but little Known in the United States

The following varieties, though for the most part little known in the United States, have received mention in American literature, and have doubtless all been grown here at one time or another. Both Downing and Fuller mention additional varieties of promise which had apparently not been tried on this side the water. No doubt others, not included in this or the preceding list, have also been brought to America without attracting general attention:

B. Atlas (Hort. 2:410), Bendelon (Mich. Exp. Sta. Bull. 118: 22), Bennet's Eureka (Rept. U. S. Pomologist, 1891:394), Bobby (on sale by Fred. E. Young, Rochester, N. Y.), Companion (Hort. 1854:142), Conqueror (Fuller, Small-Fruit Culturist, p. 223), Dr. Woolley (for sale by Fred. E. Young, Rochester, N. Y.), Early Kent (Gar. Month. 1875:207), Echo (Hort. 1854:142), Green Globe (Fuller), Green Willow (Hort. 1854:142), Hunt's Tawny (Fuller), Irish (E. P. Powell's best gooseberry for 60 years.—Gar. and For. 7:278), Jolly Printer (Hort. 2:410), Large Crystal (Fuller), Late Emerald (Gar. Month. 1877:275.—Roe, Success with Small Fruits), Red Walnut (Fuller), Roe's Seedling (Gar. Month. 1876:240.—1877:274), Royal George (Fuller), Royal Sovereign (Fuller), Westerman's Favorite (Gar. Month. 1869:271), White Dutch (Fuller), White Walnut (Fuller), Yellow Amber (Recommended by B. G. Smith as one of four best English varieties.—Mass. Hort. Soc. Rept. 1883: [Part I] 125).

Described by Downing, Fruits and Fruit Trees of America.—Bonny Lass, Bright Venus, British Crown, Bunker Hill, Cheshire

Lass, Duck Wing, Early Green Hairy, Glenton Green, Golden Drop, Golden Fleece, Golden Gourd, Green Gage (Amer. Pom. Soc. List, 1850; Hov. Mag. 16:305; Fuller), Green Laurel (Amer. Pom. Soc. List, 1850; Hov. Mag. 16:305), Green Ocean, Green Prolific, Green Walnut (Fuller; recommended by N. Y. Agr. Soc.; also by Amer. Pom. Soc. in 1850), Greenwood, Heart of Oak, Jolly Tar, Keen Seedling, Lady of the Manor (Hov. Mag. 16:427), Miss Bold, Rifleman, Roaring Lion (exhibited before the Massachusetts and Buffalo Horticultural Societies in 1852, and before the Pennsylvania Horticultural Society in 1853; Hov. Mag. 1852:41, 519.—1853:378), Rockwood, Sheba Queen (Hov. Mag. 16:427), Top Sawyer, Viper, White Honey, White Lion, Yellow Ball, Yellow Champagne (Fuller).

Grown at the Geneva (N. Y.) Experiment Station.—Described in Bulletin 114.—Alderman, Alice, Antagonist, Apology, Auburn (Mich. Exp. Sta. Bull. 118:22), Beauty, Berry Early Kent, Bollin Hall, British Queen, Briton, Broom Girl, Bull Dog, Bury Lane, Candidate, Careless, Catherine, Cheerful, Clayton, Countess of Amsdale, Crank, Cremore, Criterion, Cypress, Dagwell No. 1, Dan's Mistake, Diadem, Drill, Duck Wing, Duke of Sutherland, Duster, Faithful, Falstaff, Fascination, Flextonia, Flora, Forester, Foworius, Foxhunter, Freedom, Galopin, Garibaldi, General, George Ridley, Gipsy Queen, Golborne, Golden Drop, Golden Prolific (Pop. Gar. 4:166), Governor, Great Rock, Greenock, Green Walnut (Fuller; recommended by N. Y. Agr. Soc.; also by Amer. Pom. Soc. in 1850), Gretna Green, Harriet, Helpmate, Hero of the Nile, Highlander, High Sheriff, Hit or Miss, Hue and Cry, Ironmonger (Fuller; Amer. Pom. Soc. List 1850; Hov. Mag. 16:305), Italy, Jem Mace, Jerry, Jessie, John Anderson, John Hall, Jolly Sailor, Keen Seedling, King of Triumphs, Lady Houghton, Lady Stanley, Largo, Lavinia, Leader, Leviathan, Lion's Provider, Lizzard, London, Long Barney, Lord Leigh, Lord Ranclíffe, Lord Scarborough, Lowton, Major Hibbert, Marlboro, Mary Ann, Miss Chester, Mitchell, Mitre, Monarch, Monument, Mount Pleasant, Mrs. Bowcock, Mrs. Whittaker, Nailor, Nancy, Napoleon le Grand, Nottingham, Overseer, Overall, Peru, Peto, Pilot, Plowboy, Postman, President, Pretender, Priscilla, Queen Anne, Queen of Triumphs, Queen Victoria, Red Robin, Ringer, Roaring Lion (exhibited before the Massachusetts and Buffalo Horticultural Societies in 1852, and before the Pennsylvania Horticultural Society in 1853; Hov. May. 1852:41, 519—1853:378), Rough Red, Rover, Rumbullion, Shiner, Sir George Brown, Slaughterman, Snowdrop, Speedwell, Sportsman, Stella, Telegraph, Thatcher, Thomas Williams, Thompson Seedling, Tichborne, Transparent, Try Me Oh, Unity, Veteran, Village Green, Viper, Visit, Wakeful, Watson, Weathercock, White Hare, William Watson, Wonderful, Yaxley Hero.

RECOMMENDED VARIETIES

The Downing is the one gooseberry to be generally recommended at the present time. Houghton may be able to endure more trying conditions, and is often more productive, but is smaller.

The English varieties are to be recommended only to those who are willing to inaugurate a vigorous spraying campaign against the mildew. To such the Industry, Wellington Glory, Columbus and Chautauqua are worthy of consideration.

Beach makes the following summary remarks about varieties of gooseberries:* "So far as we are able to judge at present, Industry, Crown Bob and Lancashire Lad are among the best of the large European kinds to grow for marketing green fruit. Wellington Glory has made an excellent record here, and Whitesmith is also generally considered good and productive, but has not done as well as Wellington Glory. Among the American-grown seedlings of the European class which have been fruited here, Dominion and Triumph deserve especial mention as worthy of extended trial. The best of the American class of gooseberries are unexcelled in flavor, quality, hardiness and productiveness. They do not have the objectionable thick, tough skin which is common to varieties of the European class, but are inferior to them in size. Downing has long been considered the standard of excellence in the American class. Among the recently introduced varieties of this

*Bull. 114, N. Y. State Exp. Sta.

class, the American Red Jacket, Champion and Pearl deserve especial mention."

ORNAMENTAL CURRANTS AND GOOSEBERRIES

The best known species in this role is the Flowering Currant, *Ribes aureum* (known also as *R. fragrans*), so common in eastern gardens. This is a most attractive plant early in spring. It forms a graceful, drooping shrub, well adapted to masses or groups. In the early months of summer few plants are more attractive than this, regardless of its bloom, for its foliage is bright and glossy, and the form of the plant perfect. Yet before the middle of August its leaves are mostly gone. Were it not for this defect, few plants would deserve a higher rank for ornament.

The most showy plant of the genus is the Fuchsia-flowered Gooseberry, *Ribes speciosum*, of the Pacific coast. Its flowers are long, bright red and showy, and its foliage small, firm and glossy. Whether good in habit of plant or not, I do not know, nor whether it will thrive well outside the clime of its choice, but its flowers are certainly more attractive than those of many plants far more widely grown for the beauty of their bloom.

A plant which has received much more attention for its flowering qualities is the Red-flowered Currant, *Ribes sanguineum*. It has been frequently grown both in the United States and in Europe, and seems to be everywhere prized. The flowers are rose-colored or reddish purple, borne in long, leafless racemes and

produced in great profusion. Unfortunately, it is not entirely hardy in the northern states, needing some protection, which the beauty of its bloom will well repay.

A hardier plant is the hybrid between the preceding species and *Ribes aureum*, which is commonly known under the name *Ribes Gordonianum*. This is not so hardy as *Ribes aureum*, but will stand more exposure than *Ribes sanguineum*. It is intermediate in character between the two parents, resembling *R. sanguineum* in shape of flower, though the flowers are lighter in color and nearly odorless, while the character of bush is more like *R. aureum*. Although not a common plant, it has been well known, both here and abroad, and frequently mentioned in horticultural literature.

Several species of the Menziesii group have large, attractive flowers, particularly *R. amictum*, and *R. Californicum;* also, *R. Lobbii*. Whether they would prove attractive in habit of plant and sufficiently well adapted to cultivation to give them value, I am unable to say.

The common gooseberries may well play a part in systematic ornamental planting for the production of easy and graceful spring effects. Were it not for the habit of early losing their leaves, there would be few plants more useful. *R. oxyacanthoides* and *R. gracile* are especially desirable.

The native black currant, *Ribes Americanum*, also forms a pretty and graceful shrub, and its flowers are large enough to add to its beauty.

CHAPTER XVI

INSECTS INJURIOUS TO THE GROSELLES

Like all other economic plants, the groselles are subject to attack from insects of divers character, appearance, and habits. Some only take a passing bite, like the schoolboy who devours beech leaves, "sweetbrier," birch, etc., to appease his ceaseless cravings in the long hours from meal to meal. Others, indifferently feeding upon whatever plant is available, may at times eat more than we wish. Still others, on evil bent, assiduously seek out our cherished bushes and settle down to a steady diet of groselles with all the persistence characteristic of their race. The list immediately following comprises those most likely to work serious injury.

THE LEADING PESTS

The Four-lined Leaf-bug

Pœcilocapsus lineatus (Fabr.).–Order Hemiptera. Family Capsidæ.

Lintner, N. Y. Rep. 1: 271. Saunders, Ins. Inj. to Fruits, 350 (2nd edition). Cook, Bull. Mich. Exp. Sta. 76 : 10. Slingerland, Bull. Cornell Exp. Sta. 58 : 207–239. *Pœcilocapsus 4-vittatus* (Say). Riley, Bull, U. S. Div. Ent. 13:7. Webster, Bull. U. S. Div. Ent. 13 :54. For complete synonymy, see Slingerland, l. c.

This is a native insect which was first described by Fabricius in 1798. It came into notice as injurious to dahlias, currants and other plants soon after the middle of the present century, and has never ceased its evil ways from that day to this. Its food plants embrace esculent and ornamental plants and a few weeds.

The insect appears about the middle of May in northern latitudes, and takes up its abode on the tenderest leaves at the tip of the twigs. It is then too small to be readily seen, but by means of its proboscis, a perpetual self-acting pump, it immediately begins to drain the leaf of its sap. At first its work is not conspicuous, but soon becomes manifest by the appearance of small, dark spots, which later turn brown and die, the soft part of the leaf within having been sucked out. These spots, which at first are not larger than the head of a pin, may become much larger and even run together, causing the death of the entire leaf. The shoot itself may be checked in growth, or even killed.

The nymphs, or immature forms of the insect, are at first very small, but easily recognized by the shining vermilion-red color of the body, marked by blackish spots on the thorax. The mature insect is a bright orange-yellow colored bug, three-tenths of an inch long, with four black stripes extending down the back.

The eggs are laid in clusters in slits near the tips of twigs of the present year's growth of currants, gooseberries, and other shrubs. They are deposited late in June, and remain in this position until the nymphs hatch the following spring. These undergo five moults before reaching the adult form. The adults disappear early in July, there being but one brood a year.

Remedies.—Since the insect feeds by sucking the sap of the plant from the inner tissues of the leaf, the application of poisons like Paris green can do no good. Kerosene emulsion, diluted with not more than five parts of water, if very thoroughly applied while the insects are still young, will prove effective. The egg clusters are not difficult to find, and since they remain over winter, trimming off and burning five or six inches of infested twigs is a practicable remedy, at least on a small scale.

The Currant Plant-louse

Myzus ribis (Linn.).—Order Hemiptera. Family Aphididæ.

Lintner, N. Y. Rep. 9 : 370. Weed, Ins. and Insecticides, 100. *Aphis ribis*, Linn. Saunders, Ins. Inj. Fruits, 351.

This is a small, yellowish plant-louse, appearing on the under surface of currant leaves toward midsummer, causing them to

curl and present a blistered and generally a reddish appearance on the upper surface. This, like other plant-lice, may be destroyed by kerosene emulsion, but is so protected within the curled leaves as to be very difficult to reach. Success depends on applying the remedy very promptly before the leaves become much curled. In the home-garden, hand-picking will doubtless prove simpler. The larvæ are often destroyed in great numbers by the two-spotted lady-bug. They are also subject to attack from a small hymenopterous parasite, which often does good service in depleting their numbers.

The San José Scale

Aspidiotus perniciosus, Comstock.—Order Hemiptera. Family Coccidæ.

Comstock, Rep. U. S. Dept. Agr. 1880 : 304. Howard, U. S. Div. Ent. Circular 3, 2d series. Riley, Rep. U. S. Dept. Agr. 1893 : 215.

This insect first made its appearance in California about 1870, and is supposed to have been introduced from Chili. It was described by Professor Comstock in 1880, and since then has received attention from numerous writers. It has worked serious injury in California, and although not reported east of the Missouri River until 1893, it has become widely scattered throughout the eastern states. The insect is a near relative of the oyster-shell bark-louse, and appears as a round, flat scale about an eighth of an inch in diameter, resembling the bark in color, but with a black speck in the center. It attaches itself to the fruit and branches of pear, peach, apple, raspberry, gooseberry, currant, and other plants. It is thus distributed both on fruit and nursery stock, a fact which accounts for its rapid and widely scattered distribution. The females are wingless, but when young can crawl short distances before becoming fixed in their position.

Remedies.—The San José scale is not easily baffled. It has recently caused much excitement in the pomological world. An avalanche of literature and legislation has been hurled against it, and remedies without number have been tried. The treatment recommended by the Division of Entomology at Washington consists in thorough spraying with whale-oil soap and water in the proportion of two pounds to the gallon, when the trees or plants are dormant, preferably toward spring, since early spraying has

been found to reduce the amount of bloom. Infested nursery stock can be most effectively treated by hydrocyanic acid gas, but this is a dangerous insecticide, which should be used only by those who know perfectly well how to do it.* Late experiments at Cornell and in New Jersey show that the pest is easily destroyed in summer by a spray of kerosene and water. At Cornell, one part of kerosene to four of water gave efficient treatment.

The Gooseberry Fruit-worm

Zophodia grossulariæ (Pack.).—Order Lepidoptera. Family Phycitidæ.

Pempelia grossulariæ, Pack. Riley, Mo. Rep. 1:140. *Myelois convolutella*, Zell. Thomas, Ill. Rep. 7:251. *Dakruma convolutella.* (Zell.), or (Hübn.). Saunders, Ins. Inj. Fruits, 357. Weed, Ins. and Insecti., 101.

The larva of this moth works within the fruit of the gooseberry, and sometimes of the currant. The moths appear early in spring and deposit their eggs on the surface of the very young fruit. The larva bores into the fruit and eats out its contents. When one berry is disposed of another is fastened to the now empty shell, and the worm bores its way into that one. Several fruits may be thus destroyed. The larva commonly reaches maturity by the first of July, when it is a pale green caterpillar, about three-fourths of an inch long, with a small, pale brown, horny looking head. It then descends to the ground and spins a thin cocoon among fallen leaves and rubbish, within which it changes to a chrysalis, remaining in this condition until the following spring.

Remedies.—Infested berries color prematurely, and can be hand-picked, taking care that the very active worms do not quickly leave the fruit. If chickens are allowed in the field after fruiting time, they will consume many of the chrysalids.

The Imported Currant Borer

Sesia tipuliformis (Linn.).—Order Lepidoptera. Family Sesiidæ.

Comstock, Man. of Ins., 261. *Ægeria tipuliformis*, Linn. Saunders, Ins. Inj. Frts. 336. Cook, Rep. Mich. Hort. Soc. 1890 : 106. *Trochilium tipuliforme* (Linn.). Fitch, N. Y. Rep. 3 : 423.

This is a slender, rapid-flying, wasp-like, dark blue moth, half

* See The Nursery-Book as to use of hydrocyanic acid gas.

an inch long and three-fourths of an inch broad, having three yellow bands across the body and a yellow collar. It appears toward the end of May or the first of June, and deposits its eggs upon the stems near a bud. When hatched the larva eats its way directly to the center, thence upward and downward in the pith. Here it remains until the following year, meanwhile eating out a tunnel from six to twelve inches in length. When full grown, the larva is about half an inch long, white, with a brown head and a few hairs scattered over its body. Like many other immigrants in the insect world, this species appears to prosecute its work with renewed energy in the home of its adoption, far outstripping the native currant borer in the success of its undertakings. It prefers the red currant, but it is not too fastidious to accept the black currant or gooseberry as a substitute when occasion demands.

Remedies.—The method of treatment, which is the same for all species of borers attacking these plants, consists in pruning away and burning all infested canes, late in winter or early in spring, before the moths emerge. With several canes allowed to grow, and all wood cut away after it has borne one or two crops, this result will be accomplished with little extra trouble.

The Currant Span-worm

Diastictis ribearia (Fitch).—Order Lepidoptera. Family Enomidæ.

Comstock, Manual, 279. *Abraxas ribearia*, Fitch, N. Y. Rep. 3 : 427. *Eufitchia ribearia* (Fitch). Riley, Mo. Rep. 9 : 3. Cook, Bull. Mich. Exp. Sta., 73 : 9.

This is the larva of a native pale yellowish moth, marked with several dusky spots, and measuring about an inch and a quarter across. The larva when full grown is about an inch long, of a whitish color, with broad yellow stripes running down the back and sides, and with a number of black spots on each segment. It is a "measuring worm," moving by arching its body in the center. When disturbed, it drops from the leaf and remains suspended in the air by a web. It is most commonly found upon the gooseberry or black currant, appearing soon after the leaves expand. It attains its full growth within three or four weeks, descends to the ground and transforms to a pupa, hidden by rubbish, or just be-

neath the surface of the ground. The moth emerges about two weeks later. The eggs are laid singly on the twigs, which they resemble in color, and are therefore hard to detect. Here they remain until spring, there being but one brood a year. It thus happens that the sale of plants affords a ready means for the spread of the insect.

Remedies.—This is commonly not a serious enemy, but when it does become numerous, is more difficult to destroy than the ordinary currant worm. Hellebore, if used, must be much stronger than for the imported currant worm. Paris green will prove more effective whenever the fruit does not prevent its use. Disturbing the bushes and gathering up the worms as they hang suspended from their webs, is sometimes recommended. Several parasites prey upon them and do good service in thinning out their ranks.

The Currant Fruit-worm

Eupithecia implicata, Walk. Var. *interrupto fasciata*, Pack. Order Lepidoptera. Family Geometridæ.

Fupithecia interrupto-fasciata, Pack. Thomas, Ill. Rep. 11 : 23. Saunders, Ins. Inj. Frts. 352.

This is a span-worm which attacks the fruit of the currant by eating a hole into the side of the berry, and devouring a portion of the interior, spoiling more fruit than it actually consumes. It is easily distinguished from the gooseberry fruit-worm by having only ten legs, while the latter has sixteen.

Remedies.—While seldom causing serious injury, it may, under favorable conditions, develop sufficient numbers to work much harm. It appears at the same time as the common currant worm, and the ordinary treatment with hellebore may also keep it in check. Pyrethrum, and probably air-slaked lime, applied when the dew is on, would doubtless prove effective.

The Gooseberry Midge

Cecidomyia grossulariæ, Fitch.—Order Diptera. Family Cecidomyiidæ.

Fitch, N. Y. Rep. 1:176.—3:150. Saunders, Ins. Inj. Frts., 359.

This insect is a small, yellowish fly, scarcely one-tenth of an

inch in length. The eggs, which are deposited beneath the skin of the young fruit, hatch and develop into small, bright yellow, oval maggots, resembling those of the wheat midge. These change to pupæ within the fruit, and emerge as perfect flies in midsummer. Further than this the life history seems to be unknown. Their presence causes the fruit to turn prematurely red and become soft and putrid within.

Remedies.—The only remedy thus far known to be effective is to pick and destroy all fruit which turns prematurely.

The Currant Fly

Epochra Canadensis (Loew.).—Order Diptera. Family Muscidæ.

Saunders, Ins. Inj. Frts., 352. Harvey, Maine Agr. Exp. Sta. Ann. Rept. 1895 : 111.—Also Bull. 35. *Trypeta Canadensis*, Lœw, Mon. Dip. N. Am., 3 : 235. Gillette, Bull. Colo. Exp. Sta., 19 :18.

This insect is a yellow or orange-colored fly, about the size of the common house-fly, with greenish iridescent eyes and smoky patches or bands across its wings. It punctures the skin of the young currant or gooseberry, depositing its egg just beneath. This soon develops into a small white grub which measures about one-third of an inch in length. Its presence causes the fruit to turn red and fall to the ground prematurely. After becoming full grown, the maggots leave the fruit and enter the ground, where they change to pupæ, emerging as perfect flies early the following summer.

Although not usually considered a serious enemy, it has been found very destructive in Colorado, and also in Maine, causing the loss of 75 per cent of the fruit at times.

Remedies.—No very practicable remedy seems yet to have been found. The insect spends about eleven months of the year safely buried in the ground. No way of destroying the mature flies seems feasible, and the egg is deposited beneath the skin of the fruit beyond the reach of insecticides. The only weak point in its campaign appears to be that part of the infested fruit drops prematurely and the larvæ remain in it for a time after it falls. Hence, frequently gathering and burning the fallen fruit will destroy many. If all the insects thus fell with the fruit, this would

be an effective, though somewhat expensive remedy, but unfortunately some larvæ escape from the fruit before it drops. One grower thinks that allowing young chickens among the bushes till picking time, and older fowls later, proved effective. The pupæ transform within an inch of the surface, so that thorough cultivation would disturb many of them, and might expose them to subsequent injury during winter, or favor their being picked up by birds. Removing an inch of soil would carry them with it. The flies are thought to be so weak that a heavy mulch placed about the plants while the pupæ are in the ground, and allowed to remain, would prevent many of them from emerging.

The American Currant Borer

Psenocerus supernotatus (Say).—Order Coleoptera. Family Cerambycidæ.

Fitch, N. Y. Rep. 3 : 416. Saunders, Ins. Inj. Frts., 337. Cook, Rep. Mich. Hort. Soc. 1890 : 106.

This insect, though very similar in its habits to the imported currant borer, belongs to an entirely different order. When mature, instead of being a moth, it is a small, narrow, brownish beetle, nearly cylindrical, and varying in length from one-eighth to one-fourth of an inch. The larva is a small, white, round and wrinkled grub without feet. The life history is practically the same as that of the imported insect, and larvæ of both are sometimes found together in the same stalk.

Remedies.—Cutting out and burning infested stalks will prove effective.

The Imported Currant Worm

Pteronus ribesii (Scop.).—Order Hymenoptera. Family Tenthredinidæ.

Marlatt Revis. Nematinæ of North Amer., 61. *Nematus ventricosus*, Klug. Riley, Mo. Rep. 9 : 7. Saunders, Ins. Inj. Frts., 339. Weed, Ins. and Insds., 97. *Nematus trimaculatus*, St. Fargeau. Fitch, N. Y. Rep. 12 : 909. For full bibliography, see Marlatt, l. c.

This most familiar inhabitant of the currant and gooseberry bushes is a four-winged saw-fly, about the size of the common house fly. It first appeared in the United States in the vicinity of

Rochester, N. Y., about 1857, being mentioned in "The Rural New-Yorker" of July 24, 1858, p. 239. The male is black, with some yellow spots, glossy wings and yellow legs. The female is larger than the male, bright honey yellow, with a black head. It is not in this dress, however, that we best know the insect. Its eggs are deposited in rows on the under side of the leaves, along the principal veins (Fig. 76), in early spring. Dr. Lintner observed a female deposit thirty eggs on a single currant leaf within one hour. These hatch in a few days, and open the season's campaign by eating small holes in the leaf. The eggs are laid in rows, and the young larvæ at first feed in companies (Fig. 77), but later, as size and appetite increase, they scatter to all parts of the bush.

Fig. 76. Eggs of the currant worm.

The insect is fastidious in its dress during the larval stage. It first appears in a modest garb of dull white, which it soon exchanges for green, to which many black spots are added later, these in turn giving place to a plain green tinged with yellow, as it approaches maturity. When full grown, it measures about three-quarters of an inch in length. It then forms a silken cocoon, hidden by rubbish on the ground, just beneath the surface, or occasionally attached to stems and leaves above ground. The winged insect emerges the last of June or first of July, to repeat the same cycle, there being two broods a year, the last one passing the winter in the pupa state. The separate broods do not emerge all at once, hence there is a practical continuation of hostilities throughout the season.

Remedies.—A history of the remedies which have been employed against this insect since its advent in this country would afford spicy reading, with no lack of variety. It is interesting to note that the use of kerosene emulsion seems to have had its beginning in fighting this insect, about 1870.* The following brief mention will show something of the range of ammunition brought into play against this enemy. Salt and water, Gardener's Monthly, 1881: 17. Tobacco water, Ibid, 1881: 241. Sulphur sprinkled on the bushes when wet, Ibid, 1882: 148. Smudge with burning leather and sulphur under the bushes, Ibid, 1862 : 213. Red currants untouched if black currants are planted among them, Tilton's Journal, 8 : 35. Copperas dissolved in water, Ibid, 8 : 23. Carbolate of lime, Ibid, 9 : 149. Tansy decoction, Ibid 9 : 246. Wood ashes applied when leaves are wet, Ibid 9 : 309; also "Rural New-Yorker," 1897 : 375. Carbolic acid, Horticulturist, 1870 : 221. Picking off leaves at base of bushes where most eggs are deposited before they hatch, or immediately after. Coal tar dissolved in turpentine, with slaked lime and water added, Ibid, 1870 : 222. Knocking off the worms to let them fall on the hot ground when the sun is bright, Ibid, 1871 : 159. Howe Cave fertilizer, Grafton mineral fertilizer and Colburn's currant-worm exterminator mentioned as ineffectual, Ibid, 1873 :172. Mixing wood ashes with the soil, Ibid, 1873 : 192. Mulching with tobacco stems, "Popular Gardening," 2 : 129. Mulching with coal ashes, Ibid, 6 : 220. Air-slaked lime and tobacco dust, Insect Life, 1 : 17. Alum, Ibid, 1 : 229. Decoction of foxglove, Gar. Month., 1874 :

Fig. 77. First work of currant worm.

*Tilton's Journal, 8: 23, 176.—9:213. Gardener's Monthly, 1874: 149.

254. Soot, also rue and chamomile planted among the bushes, Tilton's Jour., 4 : 233. Decoction of elder leaves and tobacco water, Ibid, 7 : 187. Young chickens, Hovey's Mag., 1854 : 527.

In 1869, the Massachusetts Horticultural Society offered a prize of twenty-five dollars for "a safe, certain and economical method, better than any now known, of destroying the currant worm, or preventing its ravages."

It is easily controlled by the application of white hellebore, half an ounce or a teaspoonful to a gallon of water, as soon as the worms appear. The eggs of the first brood are laid chiefly on the tufts of leaves at the base of the plant, and Paris green or London purple may be used for the first application, while the larvæ are yet on these leaves. The work should be thorough, for if the bushes are defoliated, even after the fruit is off, the crop of the succeeding year suffers in consequence. At the Ohio Experiment Station, the cost of spraying twice and completely protecting the plants was found to be but $5 per acre.

The Native Currant Worm

Pristiphora grossulariæ, Walsh.—Order Hymenoptera. Family Tenthredinidæ.

Walsh, Pract. Ent., 1 : 123. Riley, Mo. Rep., 9 : 23. Saunders, Ins. Inj. Frts., 343. Walsh and Riley, Amer. Ent., 2 : 22. *Pristiphora rufipes*, St. Fargeau. Fitch, N. Y. Rep., 12 : 908. Saunders, Ins. Inj. Frts., 344.

This is a saw-fly closely related to the imported currant worm, though smaller in size, and belonging to a different genus. The larva is solid green in color, never having black spots like the other. The life history is much the same, except that the second brood emerges from the pupal stage in autumn, and deposits its eggs upon the branches, where they remain during the winter, hatching the following spring. The young larvæ do not feed in groups. This insect seldom causes serious injury. It is mentioned chiefly on account of its relationship to its European cousin, by whom it is so far outstripped in the work of life set apart for a currant worm to do.

Remedy.—The same remedy employed against the other insect is effective against this one.

The Currant Stem-girdler

Janus integer (Norton).—Order Hymenoptera. Family Uroceridæ.

Slingerland, Bull. Cornell Univ. Exp. Sta., 126 : 41. *Cephus integer*, Norton, Proc. Bost. Soc. Nat. Hist., 8 : 224. *Janus flaviventris*, Fitch, N. Y. Rept., 7 : 12. Lintner, N. Y. Rept., 4 : 47.—8 : 166. *Phyllœcus flaviventris* (Fitch). Marlatt, Ins. Life, 6 : 296.—7 : 387.

This, too, is a native saw-fly, but the larvæ, instead of feeding on the leaves, like the others, burrow in the pith of the currant stems. The egg is laid within the pith of the young shoots a few inches from the tips. After depositing the egg the female fly moves upward and proceeds to girdle the stem at a point from half an inch to an inch above where the egg was placed. The cane may be entirely severed by this girdling, or may still cling by a small portion, but quickly wilts, and generally soon falls away. The larva, which is nearly half an inch long at maturity, burrows downward, eating out the pith as it goes, and leaving its channel filled with dark brownish refuse. Toward autumn it eats a passage way to the outer bark, wraps itself in a thin silken cocoon and passes the winter in the lower end of its burrow. In the spring it changes to a pupa, and thence emerges as a perfect insect in May. It is then a shining black fly, with the hind part of the body and front of the abdomen yellow, measuring about half an inch in length by three-fourths of an inch in breadth, with the wings extended.

Remedies.—Cutting out and burning all injured tips is an efficient and practical remedy. The larvæ rarely get more than six inches below where the egg is laid, and this being only an inch or so below the girdle, cutting away eight inches of the stem at any time during the summer or winter, will destroy the insect. If done soon after the girdle is made two or three inches will suffice. The larvæ may readily be found by splitting open the cane. Many eggs fail to develop, and the young larvæ often perish before attaining their growth. This checks their increase, but does not affect the injury for the current year. The larvæ are subject to attack from hymenopterous parasites. In one case Professor Slingerland (loc. cit.) saw five tiny parasites (*Bracon apicatus*, Prov.) emerge from a single cocoon.

THE LESS IMPORTANT ENEMIES

The foregoing list includes those species which have either proved themselves, or which promise to be, seriously injurious. Many other species have been found upon these plants which seldom do harm. Many of these are general feeders, and in other cases the work is of such a nature as to affect the plant but little. No sharp line can be drawn between those which do much and those which do little injury, for under special conditions the ones which are normally of little importance may become unusually destructive.

Class Arachnida (Spiders and their relatives)

Order Acarina

Tetranychus telarius (Linn.). Saunders, Ins. Inj. Frts. 355. The Red Spider, which occasionally attacks the black currant in dry weather.

Bryobia pratensis, Garman. The Clover Mite. Riley and Marlatt Ins. Life, 3:45. Observed on wild gooseberry, *Ribes gracile*, at Lincoln, Nebr.

Tyroglyphus ribis, Fitch. N. Y. Rep. 3:424. On diseased currant stems.

Class Hexapoda (Insects)

Order Orthoptera

Family Acrididæ.

Melanoplus femur-rubrum (DeG.). [*Caloptenus femur-rubrum* (DeG.). Ill. Ent. Rep. 14 (Gen. Ind. Supplement).] The common red-legged grasshopper. A general feeder.

Family Locustidæ.

Amblycorypha oblongifolia (DeG.). [*Phylloptera oblongifolia*, DeG. Riley, Amer. Ent. 2:182.] Eggs occur on currant and other woody stems.

Order Hemiptera

FAMILY COREIDÆ.

Leptoglossus phyllopus, Linn. Ins. Life 4:79. On currant leaves; normally predaceous.

FAMILY PENTATOMIDÆ.

Cosmopepla carnifex (Fabr.). Lintner, N. Y. Rep. 2:144. Attacking currant fruit.

FAMILY FULGORIDÆ.

Poeciloptera pruinosa, Say. Fitch, N. Y. Rep. 3:436. Saunders, Ins. Inj. Frts. 357. Riley, Mo. Rep. 5:122. On leaves and young shoots of many plants.

FAMILY JASSIDÆ.

Typhlocyba obliqua (Say). [*Erythroneura obliqua* (Say). Fitch, N. Y. Rep. 3: 435.] On currant leaves.

Typhlocyba tricincta (Fitch). Forbes, Ill. Rep. 14:115. [*Erythroneura tricincta*, Fitch. N. Y. Rep. 3: 392.] On leaves of currant, raspberry, grape and elm.

Empoasca albopicta (Forbes). [*Empoa albopicta*, Forbes, Ill. Rep. 13:181.—14:117. Weed, Rep. O. Exp. Sta. 1888:152.—Ins. and Insecticides 99.] On leaves of apple, currant, gooseberry and other plants. Remedy, pyrethrum.

FAMILY APHIDIDÆ.

Nectarophora lactucæ (Kalt.). [*Siphonophora lactucæ*, Linn. Thomas Ill. rep. 8: 60.] On lettuce, Ribes and many other plants.

FAMILY COCCIDÆ.

Pulvinaria innumerabilis (Rathvon). Comstock, Rep. Cornell Univ. Exp. Sta. 2:137. Lintner, N. Y. Rep. 6:141. Saunders, Ins. Inj. Frts. 241. Piper, Bull. Wash. Exp. Sta. 7:123. [*Coccus innumerabilis* (Rathvon). For complete synonomy, see Comstock, l. c.] On many plants, including currant.*

Lecanium cynosbati, Fitch. N. Y. Rep. 3: 436. Comstock, Rep. Cornell Univ. Exp. Sta. 2:133. On wild gooseberry stems.

Lecanium ribis, Fitch. N. Y. Rep. 3: 427. Comstock, Rep. Cornell Univ. Exp. Sta. 2: 135. Saunders, Ins. Inj. Frts. 338. On currant stems.

Aspidiotus ancylus, Putnam. Comstock, Rep. U. S. Dept. of Agr. 1880: 292. Rep. Cornell Univ. Exp. Sta. 2: 58. Beckwith, Rep. Del. Exp. Sta. 7: 168. On currant.

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*A western form of this species has proved quite destructive to currants in Washington state. Prof. Cockerell proposes the variety-name occidentalis for this form. It is referred to in Meehan's Monthly, 1896:37, under the erroneous name *P. ribis*.

Aspidiotus nerii, Bouché. Comstock, Rep. U. S. Dept. of Agr. 1880: 301. Rep. Cornell Univ. Exp. Sta. 2: 63. Lintner, N. Y. Rep. 5: 279. On oleander and a great variety of other plants.

Mytilaspis pomorum (Bouché). Comstock, Rep. U. S. Dept. of Agr. 1880: 325. Rep. Cornell Univ. Exp. Sta. 2: 118. Saunders, Ins. Inj. Frts. 40. On apple, occasionally elsewhere.

Chionaspis furfurus (Fitch). Comstock. Rep. U. S. Dept. Agr. 1880: 315. Matlack, Ins. Life 1: 324. [*Aspidiotus furfurus*, Fitch, N. Y. Rep. 3: 352. *Aspidiotus cerasi*, Fitch, N. Y. Rep. 3: 368.] On apple, pear, currant and others.

Diaspis ostreæformis (Curtis). Comstock, Rep. U. S. Dept. Agr. 1880: 311. Rep. Cornell Univ. Exp. Sta. 2: 94. [*Aspidiotus circularis*, Fitch, N. Y. Rep. 3: 426. Saunders, Ins. Inj. Frts. 338.] On apple, pear and currant.

Order Lepidoptera

FAMILY EUCLEIDÆ.

Empretia stimulea, Clemens. Saunders, Ins. Inj. Frts. 113 and 353. Packard, For. Ins. 146. Comstock, Man. Ins. 225. A general feeder.

FAMILY GRAPHOLITHIDÆ.

Exartema exoleta (Zeller). [*Eccopsis exoletum*, Zell. Forbes, Ill. Rep. 14: 117.] On currant and gooseberry.

FAMILY TORTRICIDÆ.

Cacœcia rosana, Linn. Comstock and Slingerland, Bull. Cornell Univ. Exp. Sta. 23: 119. Comstock, Man. Ins. 244. On currant.

Cacœcia argyrospila, Walk. Packard, For. Ins. 192. Gillette, Bull. Colo. Exp. Sta. 19: 3. A general feeder.

Cacœcia rosaceana (Harris). Packard, For. Ins. 505. Saunders, Ins. Inj. Frts. 90. A general feeder.

FAMILY SESIIDÆ.

Alcathoë caudatum (Harris). Jack, Gar. and For. 1891: 496. [*Ægeria caudata*, Harris. French, Ill. Rep. 7: 172. *Trochilium caudatum* (Harris). Fitch, N. Y. Rep. 3: 424.] On the root of black currant and clematis.

FAMILY LIPARIDÆ.

Orgyia antiqua, Linn. Perkins, Vt. Agr. Rep. 1877: 148. Packard, For. Ins. 447.

FAMILY GEOMETRIDÆ.

Angerona crocataria (Fabr.). Thomas, Ill. Rep. 7: 243. Forbes, Ill. Rep. 13: 81. Saunders, Ins. Inj. Frts. 348. On currant, gooseberry and strawberry leaves.

Endropea armataria (H. Sch.). Saunders, Ins. Inj. Frts. 354. Packard, For. Ins. 501—Mon. Geom. 510. On leaves of maple, birch, black and red currant.

Biston cognataria (Guen.). Comstock, Man. Ins. 280. [*Amphidasys cognataria*, Guen. Lintner, N. Y. Rep. 2: 97. Bowles, Canad. Ent. 3:11. Saunders, Ins. Inj. Frts. 349. Packard, For. Ins. 405.] A somewhat general feeder.

Microgonia limbaria, Haw. [*Nematocampa filamentaria*, Guen. French, Ill. Rep. 7: 242. Packard, For. Ins. 182. Saunders, Ins. Inj. Frts. 167.] On leaves of currant, strawberry, oak and maple.

Eustroma prunata, Linn. [*Petrophora prunata*, Linn. Edwards, Bull. U. S. Nat. Mus. 35:109.] On Ribes in Europe. Introduced in America.

Prochœrodes transversata (Drury). [*Eutrapela transversata* (Drury). Packard, For. Ins. 181.] On maple, currant, oak and a few others.

Tetracis trianguliferata, Pack. French, Canad. Ent. 18:105. On *Ribes aureum*.

Thamnonoma quadrilinearia, Pack. Gillette, Bull. Colo. Exp. Sta. 19: 23. On currant and gooseberry leaves.

Thamnonoma flavicaria, Pack. Gillette, Bull. Colo. Exp. Sta. 19: 23. On currant and gooseberry leaves.

Family Noctuidæ.

Hydrœcia cataphracta (Grt.). [*Gortyna cataphracta*, Grt. Fletcher, Ins. Life 5:125.] On gooseberry fruit; unusual.

Hydrœcia nitela (Guen.). [*Gortyna nitella*, Guen. Smith, Ill. Rep. 7:112. Lintner, N. Y. Rep. 1:110. Boring in the stems of many plants.

Mamestra picta, Harris. Lintner, N. Y. Rep. 4:16.—5: 206. [*Ceramica picta* (Harris). French, Ill. Rep. 7: 226.] A general feeder; reported on currant.

Noctua clandestina (Harris). [*Agrotis clandestina*, Harris. French, Ill. Rep. 7: 95, 213. Riley, Rep. U. S. Dept. Agr. 1884: 293. Saunders, Ins. Inj. Frts. 108.] A general feeder.

Xylophasia arctica (Boisd.). Smith, Bull. U. S. Mus. 44: 137. [*Hadena arctica*, Boisd. French, Ill. Rep. 7: 96, 217. *Hadena amputatrix*, Fitch, N. Y. Rep. 3: 425.] A general feeder.

Family Arctiidæ.

Hyphantria cunea, Drury. Packard, For. Ins. 244. [*Hyphantria textor*, Harris. Saunders, Ins. Inj. Frts. 71.] The Fall Web-worm. A general feeder.

Spilosoma virginica (Fabr.). French, Ill. Rep. 7: 80. Packard, For. Ins. 340, 489. Saunders, Ins. Inj. Frts. 271. A general feeder.

Family Sphingidæ.

Deilephila lineata (Fabr.). Packard, For. Ins. 271. A general feeder.

FAMILY BOMBYCIDÆ.

Euproctis chrysorrhœa (Linn.). Fernald and Kirkland, Special Bull. Mass. Hatch Exp. Sta. 1897. A general feeder, preferring the pear.

FAMILY SATURNIDÆ.

Automeris io (Fabr.). Comstock, Man. Ins. 351. [*Hypercheria io* (Fabr.). Packard, For. Ins. 394. Saunders, Ins. Inj. Frts. 209.] A general feeder.

Samia cecropia, Linn. Comstock, Man. Ins. 356. [*Attacus cecropia* (Linn.). Thomas, Ill. Rep. 10:126. *Platysamia cecropia* (Linn.). Packard, For. Ins. 401.] A general feeder.

FAMILY LASIOCAMPIDÆ.

Clisiocampa, sp. Schwarz, Ins. Life 4: 75. Reported as injuring currants and gooseberries in Utah, by webbing up the leaves to form its cocoon.

FAMILY NYMPHALIDÆ.

Basilarchia astyanax (Fabr.). Packard, For. Ins. 128. Comstock, Man. Ins. 406. [*Limenitis ursula*, Fabr. French, Ill. Rep. 7:154. Middleton, Ill. Rep. 10: 87. Saunders, Ins. Inj. Frts. 217.] A general feeder, including gooseberry.

Polygonia comma (Harris). Comstock, Man. Ins. 405. [*Vanessa comma*, Harris, Ins. Inj. Veg. 300 (Flint, ed.). *Grapta comma* (Harris). Packard, For. Ins. 241. Fitch, N. Y. Rep. 3: 433.] On currant and hop.

Polygonia faunus (Edw.). Comstock, Man. Ins. 404. [*Grapta faunus*, Edw. French, Ill. Rep. 7:152.] On gooseberry, beech and willow.

Polygonia progne (Cramer). Comstock, Man. Ins. 405. [*Vanessa progne*, Cramer. Le Baron, Ill. Rep. 1: 59. Harris, Ins. Inj. Veg. 301. *Grapta progne* (Cramer). Fitch, N. Y. Rep. 3: 428. Packard, For. Ins. 241. Saunders, Ins. Inj. Frts. 346.] On Ribes and elm.

Order Coleoptera

FAMILY CERAMBYCIDÆ.

Hyperplatys asperus (Say.). Gillette, Bull. Iowa Exp. Sta. 11: 494. In stems of cottonwood, chestnut and currant.

Hyperplatys maculatus, Hald. Cook, Rep. Mich. Hort. Soc. 1890:109. Reported as a new currant borer.

FAMILY CHRYSOMELIDÆ.

Doryphora decemlineata, Say. Thomas, Ill. Rep. 6:162. The Potato Beetle; known to eat currant leaves.

Odontota nervosa, Panz. [*Odontota rosea* (Web.). Saunders, Ins. Inj. Frts. 120. *Hispa rosea*, Web. Harris, Ins. Inj. Veg. 120. *Uroplata pallida*, Say. Fitch, N. Y. Rep. 3: 434.] Mining in the leaves of apple, black currant and other plants.

Systena frontalis (Fabr.). Lintner, N. Y. Rep. 9: 343. Saunders, Ins. Inj. Frts. 283. On grape and gooseberry leaves.

FAMILY OTIORHYNCHIDÆ.

Epicærus imbricatus (Say.). Saunders, Ins. Inj. Frts. 35. Weed, Ins. and Insecticides 173. A general feeder.

FAMILY CURCULIONIDÆ.

Anthonomus helvolus, Boh. [*Anthonomus rubidus*, Le Conte. Fletcher, Rep. Can. Expt. Farms, 1887: 36.]

Order Hymenoptera

FAMILY ANDRENIDÆ.

Prosopis affinis, Smith. Riley, Amer. Ent. 2: 214—307. Eggs deposited in pith of currant stems.

CHAPTER XVII

DISEASES OF THE GROSELLES

The number of fungi known to attack the genus Ribes is very large, yet comparatively few are sufficiently destructive to demand consideration from an economic stand-point. The one which is best known, and which has created far more discussion than any other in American horticultural literature, is the gooseberry mildew. This disease alone, like the phylloxera of the grape, has forced the development of varieties from native species, which doubtless would not have been done had the English varieties proved successful in this climate. The following list includes those diseases which are most important.

THE MOST IMPORTANT DISEASES

Gooseberry Mildew (Fig. 78)

Sphærotheca mors-uvæ (Schw.), B. and C.—Order Pyrenomyceteæ. Family Perisporiaceæ.

Halsted, Rep. U. S. Dept. Agr. 1887:373 (Illus.). Humphrey, Rep. Mass. Exp. Sta. 10:240 (1892) (Illus.). Arthur, Rep. N. Y. State Exp. Sta. 6:349. Beach, West. N. Y. Hort. Soc. 37:512. Close, N. Y. State Exp. Sta. Bull. 133.

Chiefly found on the English gooseberry, rarely on American sorts.

As before stated, this is one of the most widely known of the diseases affecting the genus Ribes. It first appears on the young leaves and tender tips of the growing shoots. The young fruits

are soon attacked in the same way and partially or entirely checked in their growth, being rendered wholly unfit for use in most cases. It first appears as a patch of cobweb-like threads, which soon form a dense mat and become white and powdery from the development of white conidial or summer spores. These are produced in immense numbers, and are readily blown about by the wind, to contribute to the further spread of the disease. A few weeks later the winter spores, or ascospores, begin to

Fig. 78. Mildew on a young shoot.

develop. These are contained within chestnut-colored perithecia, which give a dirty brown appearance to the affected parts. These spores remain over winter within the protecting perithecium and germinate in spring, thereby spreading the species the succeeding year.

This disease, unlike many other fungi, seems to develop best in dry, hot climates, and for this reason causes much more trouble in America than in England. It is less serious in the northern portions of the United States and in Canada than farther south. Many English varieties or their seedlings have

been introduced as mildew proof, only to suffer the same injury as previous sorts after a few years of general trial. The American varieties are not wholly exempt from its attacks, but are much less susceptible, and seldom suffer serious injury.

Remedies.—Numberless remedies against the disease have been suggested. No less than fifteen of these have come under the writer's observation, most of which were reported successful in greater or less degree. Among them, mulching with sea weed, salt hay, green grass, tan bark, stones, tin cans, boards, etc., is most frequently mentioned. This does aid in many cases, as it helps to keep the soil cool, but it cannot be depended upon to afford immunity. There is now a perfectly satisfactory remedy known, and it is possible for anyone who is willing to give the matter proper attention to grow the English gooseberries in this country. Experiments inaugurated by Professor Arthur, while connected with the Geneva (New York) Experiment Station, and since carried on by others, have proved that potassium sulphide (liver of sulphur), used at the rate of half an ounce to a gallon of water, will hold this disease completely in check. Experiments with Bordeaux mixture indicate that it is also effective, though not equal to potassium sulphide. The potassium sulphide is cheap, effective, easily applied, and does not injure the plant nor render the fruit poisonous, hence is a very satisfactory remedy. It is best dissolved in hot water, then diluted to the required strength. The first application should be made when the leaves begin to unfold, and be repeated at intervals of two to three weeks, or after each heavy rain thereafter. As the injury to the plant seriously interferes with its growth, thereby lessening the succeeding crop, a thorough treatment just after the fruit is gathered is likely to prove of great value.

Anthracnose

Glœosporium Ribis (Lib.), Mont. and Desm.—Order Melanconieæ.

Saccardo, Syll. Fung., 3 :706. Kirchner, Krankheiten und Beschadigungen, 339, 344. Ellis and Everhart, Jour. Myc., 1 :110. Dudley, Bull. Cornell Exp. Sta., 15 :196.

On *Ribes rubrum*, *R. nigrum*, *R. aureum*, *R. prostratum*, and others.

The characters of this disease are less prominent than those of the gooseberry mildew, and it has attracted far less attention. The currant crop suffers serious injury by the premature falling of the leaves, which may be due to several species of fungi, this being one of them. This defoliation not only injures the fruit then on the bushes by preventing its proper development, but also materially shortens the crop of the succeeding year by preventing the proper completion of wood growth.

The spots appear on the upper surface but within the tissues of the leaves, in June or early in July. The infected parts are dull brown in color, the leaves soon turn yellow and fall, so that the bushes may be wholly denuded by the middle of August.

Remedies.—Definite reports from spraying for this particular disease are not at hand, but there is good reason to believe that thorough spraying with Bordeaux mixture will overcome all the diseases which cause the premature fall of currant leaves.

The Currant Tubercle

Tuberculariа vulgaris, Tode.—Order Hyphomyceteæ. Family Tuberculariеæ.

Saccardo, Syll. Fung., 4 4 :638. Durand, Bull. Cornell Univ. Exp. Sta., 125 :23-38. For synonymy, see Sacc., l. c.

On living currant stems and many kinds of dead wood.

This is the imperfect form of a fungus which in its perfect stage is known under the name *Nectria cinnabarina* (Tode), Fr. It is very common upon dead and decaying wood of different kinds. Recently it has proved itself an injurious parasite upon living currant bushes in New York and New Jersey. Its presence is first manifest by wilting of the leaves and premature coloring of the fruit. The clusters are usually small and straggling, and both fruit and leaves soon shrivel and fall. This is in turn followed by the death of the barren canes. In some cases the entire plant dies; in others, some canes may partially escape. Sometimes the plants die even before the leaves unfold.

Remedies.—This threatens to be a difficult enemy to fight. As

with the red rust of the raspberry and blackberry, there is a perennial mycelium, living within the tissues of the plant. There is, therefore, no cure. To dig and burn the affected bush at once is the only sure preventive against further spread. Mr. Durand finds* that the mycelium may show no indication of its presence

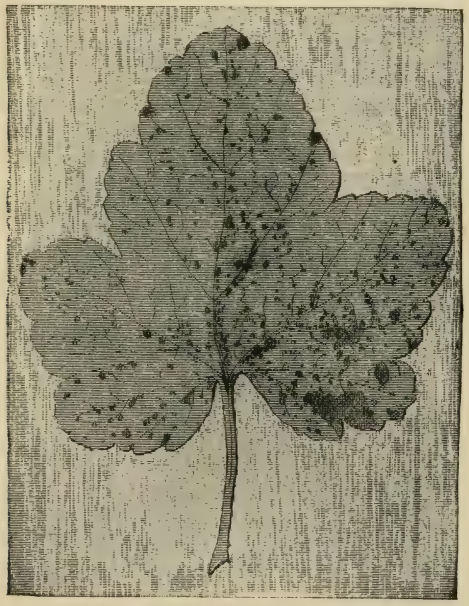

Fig. 79. Leaf-spot.

until long after entering the plant, and that the disease may therefore be transmitted in apparently healthy cuttings. This being true, it follows that cuttings should not be used from a field known to be infected. Since the fungus develops so readily in dead wood, the refuse from pruning should not be left in the field.

* Loc. cit.

Currant Leaf-spot (Fig. 79)

Septoria Ribis, Desm.—Order Sphæropsideæ. Family Sphærioideæ.

Saccardo, Syll. Fung., 3 :491. Peck, Rep. N. Y. Mus., 38 :97. Martin, Jour. Myc., 3 :73. Pammel, Bulls. Iowa Exp. Sta., 13 :45, 67.—17 :420.—30 :289.

On *Ribes rubrum* and *R. nigrum*.

This disease produces a brown spotted appearance of the leaves, followed by their premature fall.

Professor Pammel's experiments at the Iowa Experiment Station have demonstrated conclusively that it can be controlled and the foliage retained by thorough spraying with Bordeaux mixture. Five sprayings, beginning May 10 and ending July 22, proved wholly effective.

Cercospora angulata, Wint.—Order Hyphomyceteæ. Family Dematieæ.

Saccardo, Syll. Fung., 4 : 459. Winter, Jour. Myc., 1 : 124. Pammel, Bull. Ia. Exp. Sta.. 13 : 45.—17 : 420.

Professor Pammel reports this species on both red and black currants, associated with *Septoria Ribis*, and yielding to the same treatment.

Gooseberry Cluster-cup

Æcidium grossulariæ, Schum.—Order Uredineæ.

Sacc. Syll. Fung., 7 :792. Humphrey, Rep. Mass. Exp. Sta., 10 (1892):241.

On leaves and fruit of *Ribes grossulariæ*, *R. rubrum*, *R. alpinum*, *R. nigrum*, *R. aureum* and *R. rotundifolium*.

This disease varies much in frequency. Ordinarily it causes no damage, but occasionally seems to develop with unusual rapidity, and work serious injury. It is difficult to combat, for when the cluster-cups appear so that the disease is noticed, the harm for that year is already done. Picking off and destroying the infected leaves will tend to prevent damage the succeeding year, but this is hardly necessary and seldom practicable. Perhaps spraying for the gooseberry mildew may prevent the earliest infection.

OTHER INJURIOUS FUNGI

Many other fungi have been found on plants of this genus. Some of these may at times prove to be real enemies, but most of them can do little injury. A large number have been reported from Europe, but unless recorded as occurring in North America, are excluded from this list, though many of them will doubtless appear in this country sooner or later.

Order Pyrenomyceteæ

FAMILY PERISPORIACEÆ.

Sphærotheca Castagnei, Lev. Saccardo, Syll. Fung. 1: 4. Ellis and Everhart, Pyren. 8. Anderson, Jour. Myc. 5: 83. On *Ribes Americanum*.

Phyllactinia suffulta (Reb.) Sacc. Syll. Fung. 1: 5. Ell. and Ev. Pyren. 20. On Ribes and many other plants.

Microsphæra Grossulariæ (Wallr.), Lev. Sacc. Syll. Fung. 1:12. Ell. and Ev. Pyren. 24. Anderson, Jour. Myc. 5:194. Kirchner, Pflanzenkrankheiten 338. [*Alphitomorpha penicillata Grossulariæ*, Wallr.] On *R. rotundifolium*, *R. Americanum* and *R. nigrum*.

Capnodium salicinum (A. and S.), Mont. Sacc. Syll. Fung. 1: 73. Ell. and Ev. Pyren. 49. Kirchner, Pflanzenkrankheiten 338, 410, 342. On gooseberry leaves, willows, poplars, etc.

FAMILY SPHÆRIACEÆ.

Valsa ribesia, Karst. Sacc. Syll. Fung. 1:117. Ell. and Ev. Pyren. 466. [*Valsa agnostica*, Cooke and Harkness. Sacc. Syll. Fung. 9: 450.] On branches of Ribes in California.

Valsa ribicola, Ell. and Ev. Proc. Phil. Acad. 1894: 340. Sacc. Syll. Fung. 11: 273. On dead branches of *R. aureum*.

Eutypa subcutanea (Wahl.). Sacc. Syll. Fung. 1:165. On Ribes and willow.

Eutypa flavo-virescens (Hoffm.), Tul. Sacc. Syll. Fung. 1:172. On wood and bark of Ribes and many other genera.

Sphærella Grossulariæ (Fr.), Auersw. Sacc. Syll. Fung. 1: 486. Ell. and Ev. Pyren. 266. Pammel, Bull. Iowa Exp. Sta. 13: 70. On *R. nigrum* and *R. Grossularia*.

Diaporthe (Chorostate) strumella (Fr.), Fuck. Symb. Myc. 205. Sacc. Syll. Fung. 1: 613. Ell. and Ev. Pyren. 425. On dead stems of different species of Ribes.

Diaporthe (Chorostate) concrescens (Schw.), Cooke. Sacc. Syll. Fung. 9: 703. Ell. and Ev. Pyren. 445. [*Sphæria concrescens*, Schw. Sacc. Syll. Fung. 2: 378.] On dead stems of *Ribes aureum*.

Leptosphæria vagabunda, Sacc. Syll. Fung. 2: 31. Ell. and Ev. Pyren. 358. On dead wood of Ribes and all sorts of shrubs and trees.

Melanomma pulvis-pyrius (Pers.). Fuck. Symb. Myc. 160. Sacc. Syll. Fung. 2: 98. Ell. and Ev. Pyren. 181. On many kinds of wood and bark.

Cucurbitaria Ribis, Niessl. Sacc. Syll. Fung. 2: 322. Ell. and Ev. Pyren. 242. On decorticated stems of Ribes.

Fenestella vestita (Fr.). Sacc. Syll. Fung. 2: 329. Ell. and Ev. Pyren. 544. On dead branches of Ribes and many other genera.

Sphæria ribesia, Schw. Sacc. Syll. Fung. 2: 370. [This is *Diatrypella ribesia* (Schw.). Ell. and Ev. Pyren. 591.] On dead stems of *Ribes rubrum*.

Sphæria recondita, Schw. Sacc. Syll. Fung. 2: 376. [This is *Diaporthe recondita* (Schw.). Ell. and Ev. Pyren. 448.] On dead stems of *R. Americanum*.

Sphæria penicillata, Schw. Sacc. Syll. Fung. 2: 404. Ell. and Ev. Pyren. 748. On fallen branches of *R. aureum*.

FAMILY HYPOCREACEÆ.

Nectria cinnabarina (Tode), Fr. Sacc. Syll. Fung. 2: 479. Ell. and Ev. Pyren. 93. Durand, Bull. Cornell Univ. Exp. Sta. 125: 23–38. On dead branches of many kinds of shrubs and trees. [This is the perfect stage of *Tubercularia vulgaris*, Tode, which see.]

Nectria Ribis (Tode), Rabenh. Sacc. Syll. Fung. 2: 480. Ell. and Ev. Jour. Myc. 2: 79. On branches of currant and gooseberry.

Pleonectria Berolinensis, Sacc. Syll. Fung. 2: 559. Ell. and Ev. Jour. Myc. 2: 123.—Pyren. 115. Durand, Bull. Cornell Univ. Exp. Sta. 125: 34–37. On dead stems of Ribes.

FAMILY DOTHIDEACEÆ.

Plowrightia ribesia (Pers.). Sacc. Syll. Fung. 2: 635. [*Dothidea ribesia* (Pers.), Fr. Ell. and Ev. Pyren. 611.] On dry stems of various species of Ribes.

Homostegia Kelseyi, Ell. and Ev. Proc. Phil. Acad. 1890: 248. Sacc. Syll. Fung. 9: 1050. Ell. and Ev. Pyren. 616. On dead stems of *R. rotundifolium*.

Order Sphæropsideæ

FAMILY SPHÆRIOIDEÆ.

Phyllosticta Grossulariæ, Sacc. Syll. Fung. 3: 17. Kirchner, Pflanzenkrankheiten, 339, 425. Martin, Jour. Myc. 2: 15. On gooseberry leaves.

Phoma hyalina (B. and C.). Sacc. Syll. Fung. 3: 88. [*Sphæropsis hyalina*, B. and C. N. A. F. 409.] On branches of *R. rubrum*, *Viburnum dentatum*, and *Fraxinus Americana*.

Asteroma ribicolum Ell. and Ev. Jour. Myc. 5: 148. Sacc. Syll. Fung. 10: 219. On living leaves of *R. Americanum*.

Sphæropsis ribicola, C. and Ell. Sacc. Syll. Fung. 10: 255. On branches of Ribes.

Diplodia Dearnessii, Ell. and Ev. Proc. Phil. Acad. 1891: 79. Sacc. Syll. Fung. 10: 279. On decorticated twigs of Ribes.

Septoria aurea, Ell. and Ev. Proc. Phil. Acad. 1893: 163. [*Septoria aurea destruans*, Ell. and Ev. l. c. Sacc. Syll. Fung. 11: 541.] On leaves of *R. aureum*.

Rhabdospora ribicola (B. and C.). Sacc. Syll. Fung. 3: 579. Martin, Jour. Myc. 3: 90. [*Septoria ribicola*, B. and C. N. A. F. 444 bis.] On whitened stems of *R. rotundifolium*.

Order Melanconieæ

Glœosporium ribicolum, Ell. and Ev. Proc. Phil. Acad. 1893: 167. Sacc. Syll. Fung. 11: 563. On fruit of the English gooseberry.

Marsonia ribicola, Ell. and Ev. Erythea, 201. Sacc. Syll. Fung. 11: 574. On leaves of *R. aureum*.

Order Hyphomyceteæ

FAMILY DEMATIEÆ.

Coniosporium Fumago (Schw.). Sacc. Syll. Fung. 4: 242. [*Fusidium Fumago*, Schw. Syn. Am. bor. 2995.] On leaves of Ribes.

Cladosporium cubisporum, B. and C. N. A. F. 652. Sacc. Syll. Fung. 4: 355. On twigs of Ribes.

Cercospora ribicola, Ell. and Ev. Proc. Phil. Acad. 1894: 379. Sacc. Syll. Fung. 11: 626. On leaves of *Ribes sanguineum*.

Stemphylium macrosporoideum (B. and Br.). Sacc. Syll. Fung. 4: 519. On dead stems of Ribes and Acer.

FAMILY STILBEÆ.

Graphiothecium parasiticum, Sacc. Syll. Fung. 4: 624. On weak or decaying leaves of Ribes and other plants.

FAMILY TUBERCULARIEÆ.

Tubercularia confluens, Pers. Sacc. Syll. Fung. 4: 641. Farlow and Seymour, Host. Ind. 43. On Ribes and other woody plants.

Order Hymenomyceteæ

FAMILY POLYPOREÆ.

Fomes Ribis (Schum.), Fr. Sacc. Syll. Fung. 6: 184. [*Polyporus Ribis* (Schum.). Kirchner, Pflanzenkrankheiten, 341 and 403.] On stems of gooseberry and currant.

FAMILY THELEPHOREÆ.

Thelephora ribesina, Fr. (?). Farlow and Seymour, Host. Ind. 43. On Ribes.

Corticium lacteum, Fr. Sacc. Syll. Fung. 6: 610. On wood and bark of different plants.

Corticium incarnatum (Pers.), Fr. Sacc. Syll. Fung. 6: 625. Farlow and Seymour, Host. Ind. 200. On bark and wood of different plants.

Order Phycomyceteæ

FAMILY PERONOSPORACEÆ.

Plasmopora ribicola (Schroet.), Sacc. Syll. Fung. 7: 243. [*Peronospora ribicola*, Schroet. Farlow and Seymour, Host. Ind. 200. Kirchner, Pflanzenkrankheiten, 343, 379.] On *R. oxyacanthoides* and *R. rubrum*.

Order Uredineæ

Melampsora epitea (Kunze and Schm.), Thüm. Kirchner, Pflanzenkrankheiten, 339, 399. Sacc. Syll. Fung. 7: 588. Plowright, Brit. Ured. and Ust. 239. On leaves and fruit of currant and gooseberry.

Puccinia pulchella, Peck, Rep. N. Y. Mus. 25: 111. Sacc. Syll. Fung. 7: 701. On leaves of *R. prostratum*.

Uredo (*Cæoma*) *confluens* (Pers.), Schroet. Sacc. Syll. Fung. 7: 864. Plowright, Brit. Ured. and Ust. 260. [*Cæoma Ribis-alpini*, Wint. Tracy and Galloway, Jour. Myc. 4: 61. *Uredo ribicola*, C. and E. Grev. 6: 86. Sacc. Syll. Fung. 7: 859. *Uredo Jonesii*, Peck, Bull. Torr. Bot. Club 12: 36.] On *R. aureum* in America and other species in Europe.

Order Discomyceteæ

FAMILY DERMATEÆ.

Godronia Urceolus, A. and S. Sacc. Syll. Fung. 8: 601. On branches of Ribes and other plants.

FAMILY BULGARIEÆ.

Orbilia vinosa (A. and S.), Karst. Sacc. Syll. Fung. 8: 622. [*Peziza vinosa*, A. and S. Farlow and Seymour, Host. Ind. 43.] On fallen branches of various trees and shrubs.

CHAPTER XVIII

THE BOTANY OF THE GROSELLES

In order that the student may have the full range of the subject in mind, an attempt is here made to classify and describe all the species of Ribes which are native to the United States and Canada or which are cultivated here. If so great progress has been made in the amelioration of a very few species, what may not the future hold for the plant-breeder!

In the following account I have attempted to give my impressions of the botanical relationship of the plants of the genus. The view obtained has of necessity been limited and doubtless oftentimes distorted. It has been confined for the most part to herbarium material, and this, useful as it is for purposes of study, will sometimes mislead. In some cases not even this source of aid was available. More complete study will doubtless change many of the opinions expressed, dropping some forms here classed as species and admitting others not here recognized. In general I have little sympathy with the present tendency to accept species which are based on slight differences, and I have endeavored to avoid recognizing such, if the material and information at hand would admit. Yet as the study has progressed, I have felt like attaching less and less importance to the question of species. The oneness of the vegetable king-

dom has become more and more apparent. It is easy to describe species so long as single specimens from widely different localities are available, but not easy when the material is more abundant, is drawn from intermediate localities, and represents more varying forms. Then the transitions from east to west, from north to south, from valley to mountain-top and from species to species become more apparent. At best it is but passing in review a brief section of Nature's progressive line of march, and it matters little where our lines of division are drawn. If the botanist refuses to enter the garden to see the work of evolution in progress, he may discover the same process by a careful study of a single group of plants like the one in question.

A single phytogeographical hint brought out by this study may be of interest. In the genus Ribes the flowers are for the most part white and rather inconspicuous throughout the eastern portion of the country and on the Plains, with perhaps a slight tinge of color along the eastern coast. In the Rocky Mountains white but somewhat larger flowers are common, while toward the northwest coast large purple flowers become the rule. This color tendency may be only accidental with this genus, for I find no mention of such a tendency among other plants, but Professor Lawrence Bruner tells me that he has noticed a similar color variation in the wings of grasshoppers.

RIBES, LINN.—CURRANT—GOOSEBERRY

Shrubs with simple, alternate, palmately veined leaves, sometimes with narrow stipules united with the base of the petiole.

Flowers 5-parted, except in a single species, in which they are commonly 4-parted. Calyx tube coherent with the ovary, often extending beyond it; lobes commonly colored like the petals. Petals small, borne on the throat of the calyx, alternating with the stamens. Ovary 1-celled, with 2 parietal placentæ, and 2 distinct or united styles. Fruit a berry, crowned with the shriveled remains of the calyx.

Name of uncertain origin, thought by some to be from *riebs*, a German name used for the currant.

The genus is primarily a North American one. Of the thirty species mentioned by Dippel,* sixteen are North American, eleven are natives of the eastern hemisphere, and one is found in both, while two to which he gives specific names are probably hybrids. While of especial importance as a fruit-producing genus, some of its species have decided value as ornamentals.

A. Stems with 1-3 thorns below the clusters of leaves, often with numerous scattered prickles on the branches, sometimes upon the berry also. Leaves plaited in the bud. (Gooseberries.)

B. Flowers red and showy, mostly 4-parted; stamens long, exserted; berry small, currant-like. No. 1.

BB. Flowers 5-parted; calyx mostly recurved or reflexed at flowering time, later erect; stamens more or less or not at all exserted. Berry many seeded.

C. Calyx tube campanulate or cylindraceous; peduncles few-flowered.

D. Anthers sagittate, mucronate-pointed. Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10.

DD. Anthers oval or roundish, blunt.

E. Stamens much longer than the petals

F. Flowers conspicuous; calyx lobes broad and showy, dark purple-red. No. 11.

FF. Flowers inconspicuous; calyx lobes small and slender, white, greenish white, or sometimes purplish. Nos. 12, 13, 14, 15, 16.

EE. Stamens little or no longer than the petals.

F. Ovary and berry unarmed and glabrous. Nos. 17, 18, 19, 20, 21, 22, 23.

FF. Ovary and berry armed with prickles, or rough and glandular hairy. Nos. 24, 25, 26, 27.

*Handbuch der Laubholzkunde 3 :281-308.

cc. Calyx tube saucer-shaped, expanding immediately above the ovary; peduncles racemosely 5–15 flowered; berry small, currant-like, beset with glandular-tipped hairs. Nos. 28, 29.

aa. Thornless and prickless; leaves plaited in the bud; racemes few to many-flowered; stamens short. (Currants.)

b. Calyx dilated immediately above the ovary.

c. Leaves without resinous dots beneath. Nos. 30, 31, 32, 33, 34.

cc. Leaves bearing resinous dots on the under surface. Nos. 35, 36, 37, 38, 39.

bb. Calyx prolonged above the ovary into a campanulate or cylindrical tube.

c. Flowers in leafy clusters, somewhat corymb-like; leaves with rounded lobes. Nos. 40, 41.

cc. Flowers in leafless racemes. Nos. 42, 43, 44, 45, 46, 47, 48.

aaa. Thornless and prickless; leaves convolute in the bud; racemes several-flowered; calyx tube much elongated. No. 50.

Fig. 80. *Ribes speciosum* (×⅔).

1. RIBES SPECIOSUM, Pursh. Fuchsia-flowered Gooseberry. (Fig. 80.)

Stem thick and woody, 6–10 feet (2–3 meters) high, the smaller branches covered with fine prickles and glandular-tipped hairs; thorns long and slender, commonly in threes: leaves small,

thick and shining, nearly evergreen in its native habitat, three-lobed, with coarse rounded serrations, roundish or wedge-shaped at base. Flowers borne on slender, hanging peduncles, 2–4 on each, drooping, petiole and calyx tube densely covered with short grandular tipped hairs; calyx cylindraceous ½–¾ of an inch (12–20 mm.) long; stamens extending ¾ of an inch (20 mm.) beyond the calyx, both bright red, giving some resemblance to a fuchsia; anthers very short, berry prickly, dry, few seeded.

Original distribution.—The Pacific coast region, extending from California into British Columbia.

This species is distinct from all other members of the genus, owing to its long red flowers. It seems to have renounced the quiet dress of its ancestors and to have become imbued with the spirit of display so common among plants in the region of the Golden Gate. In spite of its beauty it has received little recognition as an ornamental. It deserves a place in ornamental collections wherever it will thrive.

2. R. MENZIESII, Pursh. (Fig. 81.)

Stems 5–10 feet (15–30 decimeters) high, branches naked or densely covered with fine slender bristles, grandular-tipped when young, young twigs and petioles also pubescent; thorns usually triple, very long and slender pointed, the central one reaching ¾ of an inch (20 mm.) in length. Leaves soft pubescent beneath, seldom or never viscid, 3–5 lobed, the lobes crenulate toothed and incised; peduncles 1–2 flowered; calyx purplish red, ⅜–½ inch (10–13 mm.) long, pubescent on the outside, its lobes exceeding the funnel-shaped tube, recurved or spreading at maturity; petals thickish, truncate involute, whitish, reaching the base of the white anthers; berry ⅜ of an inch (10 mm.) in diameter, densely covered with long and slender straw-colored bristles.

Distribution.—Northern California and Oregon.

The species has little to recommend it for cultivation. The fruit, though of good size, is said to be dry, and is too prickly to be of value.

3. R. SUBVESTITUM, Hook. & Arn. (Fig. 82.)

Tall, open shrub, 5–10 feet (15–30 decimeters) high, branches rather stiff and upright, sparsely beset with slender prickles and short glandular-tipped hairs, thorns triple or even quadruple, long and slender; leaves roundish, less deeply lobed than in the preceding species, bearing short stalked glands both

Fig. 81. *Ribes Menziesii* ($\times \frac{1}{2}$).

on the upper and under surface, very viscid and heavy scented; peduncles 1–3 flowered; calyx tube broadly companulate, lobes purple-red, narrow, twice as long as the tube, reflexed in flower;

Fig. 82. *Ribes subvestitum* (×⅔).

petals white, waxy, truncate, entire; strongly involute; stamens well exserted; anthers sagittate, minutely pubescent; berry large, dark red, insipid, very densely covered with short grandular-tipped prickles or hairs, which extend to the pedicels; gummy, with a strong resinous odor.

Common in the coast ranges of California.

This is not *R. subvestitum*, Hook., as figured in Bot. Mag. t. 4931. The species has little interest from a horticultural standpoint.

CC

4. R. AMARUM, McClatchie.

"Shrub 3–8 feet (1–3 meters) high, rigid stems and branches beset with yellowish brown (commonly triple) spines, often setose-hispid; leaves, inflorescence and young branches glandular-pubescent and bitterish fragrant, leaves thin, ½–1½ inches (15–40 mm.) broad, 3–5 lobed and incised; peduncles 1- or 2-flowered, 3–5 lines (6–12 mm.) long; pedicels each with a round-ovate 2–4 (usually 3) lobed bract, about three lines (6 mm.) long; flowers 3–4 inches long, calyx-tube oblong-campanulate, 3 lines (6 mm.) long, segments purplish red, reflexed, 4 lines (8 mm.) long, tips greenish, especially on back; petals pinkish white, red-streaked near base on inside, 2 lines (4 mm.) long, strongly involute, suborbicular when flattened out, rounded and erose-toothed at summit; pinkish filaments equaling or slightly exceeding the petals; anthers sagittate, ovate-oblong, mucronate, purplish, ovary densely grandular hairy; mature berry ½–¾ inch (12–20 mm.) in diameter, densely covered with glandular bristles which produce a very bitter secretion; pulp sweet."—McClatchie, Erythea, 2, 79.

This is very closely related to *R. subvestitum*, Hook. & Arn.

Described from southern California. Found in shaded cañons.

5. R. CALIFORNICUM, Hook. & Arn. (Fig. 83.)

Shrub 2–4 feet (6–12 decimeters) high, with rigid, zigzag, glabrous branches, thorns slender, brownish red like the branches, mostly single; leaves small, ½ inch (12 mm.) in diameter, 3–5 lobed, roundish, not viscid nor heavy scented, glabrous when mature; peduncles short, 1–3 flowered, pedicels short, each with a persistent, small, round-ovate bract at the base; calyx lobes lurid purple, petals white, thick, strongly involute, truncate and irregularly toothed at summit, reaching the base of the anthers; anthers ovate-oblong, purple-red, prominent; ovary glandular-hispid; berry large, prickly, not gummy.

Found in California on bleak hills, blooming earlier than other species, with a pleasant flowery odor.

6. R. ROEZLI, Regel.*

Low, much-branched shrub, branches glabrous, twigs pubescent; leaves, 3–5 lobed, glabrous on both sides, lobes rounded, doubly and coarsely dento-crenate toward the apex, petiole pubescent, setose-ciliate at the base; spines 1–3, slender, spreading; peduncles 1- to 2-flowered, puberulent, pedicels subtended by a broad truncate bract, which is pubescent at the margins,

*Gartenflora 1879 : 226. Tafel 982.

Fig. 83. *Ribes Californicum* (×⅔).

Fig. 84. *Ribes Victoris* (×½).

enwrapping the pedicel; ovary and calyx-tube densely pubescent but not glandular; calyx reddish brown, tube sub-cylindrical, longer than the ovary; lobes broad-oblong, obtuse, recurved in flower, about as long as the tube; petals white, oblong, the margins involute, truncate, dentate at the apex, one-third as long as the calyx lobes; filaments exceeding the petals, glabrous;

anthers elliptical-oblong, very glabrous and smooth, dorsal base sagittate, ventral base rounded; style much longer than the stamens, 2-cleft; leaves 2–2½ centimeters in diameter, flowers nodding; calyx, including ovary, about 1½ centimeters long, minutely pubescent.

Northwestern North America.

The original description and figure show this to be very close to *R. Californicum;* perhaps it should be referred to that species.

7. R. AMICTUM, Greene.

Shrub with the aspect of *R. Menziesii;* branches upright, smooth, straight or zigzag, thorns mostly triple, shorter than in *R. Menziesii;* leaves small, ½–1 inch (12-25 cm.) in diameter; peduncles 1- or 2-flowered; pedicels short, subtended by large, deciduous, lobed bracts, which envelop the ovary; flowers dark purple, ⅜–¾ inch (10-20 mm.) long, tube narrowly companulate, much longer than in *R. Menziesii,* lobes reflexed in flower, linear-lanceolate, acuminate, exceeding the sagittate, whitish anthers; petals white or pinkish, ⅛ inch (3 mm.) long; ovary ciliate-prickly; berry prickly but not densely so.

California and Oregon. Closely related to *R. Californicum.*

If attractive in habit and adapted to cultivation, this would be a desirable flowering shrub. Its flowers are scarcely less striking than those of *R. speciosum.*

8. R. WILSONIANUM, Greene.*

"Rigid and low shrub, with smooth branchlets and 1–3 spines at each node; growing parts and leaves more or less villous with a short pubescence; leaves small, rounded, 5-lobed, the lobes and teeth acute; peduncles rather slender, mostly 3-flowered; bracts persistent, broadly ovate, acuminate-cuspidate, villous; ovary short-prickly, scarcely villous; calyx dark red, the cylindric or slightly funnel-form tube 3 lines (6 mm.) long; segments acute, about as long; petals scarcely a line long, thinnish white with red veins, cuneate-quadrate, nearly truncate and scarcely erose at apex, and with narrow and abruptly inflexed margins; filaments scarcely equalling the petals; anthers connivent, with prominent cusp bent outwards."

This species was founded on a single specimen received and grown at the Botanic Garden at Berkeley, Cal. I have not seen specimens. It was first referred to *R. amictum* by its author in Flora Franciscana, hence must be very similar to that species.

*Erythea 3 :70.

9. R. Victoris, Greene. (Fig. 84.)

Shrub 5 feet (15 decimeters) high, branches covered with short, slender prickles and glandular-tipped hairs; leaves and young twigs pubescent and viscid, pedicels short, subtended by 1 or 2 green, persistent bracts; flowers greenish, ½–¾ inch (12–20 mm.) long; calyx tube short, campanulate, lobes greenish, glandular pubescent; petals white, thinnish, involute, acute, more or less toothed at apex; anthers white; berry glandular hispid.

Found in the coast range north of San Francisco, and in the Vaca Mountains, California.

10. R. hesperium, McClatchie.

"Shrub 5–10 feet (15–30 decimeters) high, with spreading branches; stems smooth, beset with dark colored spines, which are commonly single, but occasionally double or triple; leaves, inflorescence and young branches puberulent; leaves thin, ½–1¾ inches (15–45 mm.) broad, 3–5 lobed, the lobes incised; peduncles 1–2 flowered, 2–3 lines (4–6 mm.) long; pedicels about 3 lines (6 mm.) long; bracts broad, fan-shaped, with ciliated membranous pinkish margin; flowers about ⅜ inch (10 mm.) long; calyx tube campanulate, slightly inflated, about one line (2 mm.) long; segments from greenish white to greenish red, 3–4 lines (6–8 mm.) long; petals white, tinged with red, about half the length of the sepals, cuneate–oblong, 2- or 3-toothed, slightly involute; filaments about half longer than petals; anthers ovate-oblong, mucronate, greenish; ovary densely echinate, bristles greenish red, mature berry very prickly, ½–¾ inch (12–20 mm.) in diameter."—McClatchie, Erythea, 2 : 77.

Described from southern California. Found in shady cañons. I have not seen specimens, but it appears to agree with this section in the mucronate anthers, though perhaps lacking the sagittate base.

11. R. Lobbii, Gray. (Fig. 85.)

Shrub 2–5 feet (6 to 15 decimeters) high; branches rigid, zigzag, without prickles, somewhat resembling those of *R. Californicum.* but the younger ones glandular pubescent, the older dark brown, with scaly bark; thorns slender, mostly triple, varying in color with the bark of the branch from which they emerge; leaves less than an inch (25 mm.) in diameter, round-cordate, 3–5-cleft, the roundish lobes obtusely toothed, minutely pubescent and glandular on both sides; peduncles long and slender, 1–2 flowered; pedicels short, nearly enclosed by the broad bract; flower pendulous, half an inch long beyond the ovary; calyx lobes lurid purple, pubescent on the outside; petals white, wedge-shaped, irregularly

Fig. 85. *Ribes Lobbii* (×1).

toothed at the summit, reaching half way to the base of the anthers; style commonly 2-cleft, glabrous, together with the stamens about equaling the calyx lobes in length; anthers double, short, broad and blunt; ovary and berry densely covered with very short, fine, glandular-tipped prickles or hairs, which extend to the peduncles, petioles and other young parts of the plant.

Found on the Pacific coast from northern California northward.

In general appearance this species closely resembles *R. subvestitum*, Hook. & Arn., and is the plant figured under that name in Bot. Mag. t. 4931. *R. Lobbii* is distinguished by the absence of prickles from the stems, its long filaments and short, blunt anthers, and the shorter and finer, stiff, glandular hairs which cover its fruit.

R. Marshallii, Greene, as originally described,* seems to correspond so closely to this species that without access to specimens there does not appear to be sufficient reason for giving it specific rank.

12. R. GRACILE, Michx. (Fig. 86.)

Low shrub, the old stems generally smooth and shining, the young shoots densely covered with prickles, which scale off with the bark as they grow older. Thorns mostly single, sometimes triple, stout, straight, reddish, ¼–⅜ inch (6–10 mm.) long; branches with occasional small, slender prickles; leaves thin, rather sharply toothed, ¾–1½ inches (2–4 cm.) in diameter; peduncles mostly 2-flowered, long slender and drooping, smooth, or barely showing a trace of pubescence; flower finely divided and fragile; calyx tube narrow, almost cylindrical; lobes long and narrow, often widely extended when in flower, whitish, or greenish white; petals thin, obovate, or wedge-shaped, reflexed at the

Fig. 86. *Ribes gracile* (×⅔).

*Pittonia 1:31.

margins; stamens several times as long as the petals; filaments slender, slightly pubescent; style 2-cleft, smooth, like the stamens, projecting beyond the calyx lobes; berry smooth, of medium size, dark purple or brownish.

Michigan to Tennessee, and westward to Texas and the Rocky Mountains.

This is the common species of the Plains. It is readily distinguished by the finely divided, fragile appearance of the flower. Although not in cultivation, its adaptibility to the Plains might render it of especial value for that region if improved.

13. R. CURVATA, Small.

Low, diffusely branched shrub, the older parts covered with loose, papery bark, the younger branches small, wiry, smooth and shining, reddish or purplish in color; thorns slender, obliquely recurved, $\frac{1}{8}$–$\frac{1}{4}$ inch (3–6 mm.) long; leaves small, $\frac{3}{8}$–$\frac{3}{4}$ inch (10–20 mm.) in diameter, suborbicular; lobes rounded, not deeply cut, thick and beset with resinous dots; petioles rather slender and villous; peduncles slender, commonly one, sometimes two-flowered; flowers finely divided and fragile; calyx-tube very short; segments long and narrow, reflexed, white or greenish white; petals minute; filaments long and slender, pubescent or somewhat villous; style villous, slightly 2-cleft; ovary smooth; berry round, smooth and small.

Described from Stone Mountain, Georgia.

This is evidently the southeastern representative of *R. gracile*. It differs from that species in its smooth, shining branchlets, smaller recurved thorns, smaller, thicker and less sharply cut leaves, which bear resinous dots.

14. R. NIVEUM, Lindl.

Shrub 4–6 feet (12–18 decimeters) high, with slender, upright twigs and branches, and single to triple thorns; leaves roundish, entire at base, 3–5 lobed, somewhat pubescent when young, glabrous when older; petioles long and slender; peduncles slender, drooping, 1–4 flowered, the very slender pedicels subtended by small, broad bracts; calyx-tube smooth, short, bell-shaped; lobes long, lanceolate, at first upright, later reflexed, white and glabrous; petals white, wedge-shaped, much shorter than the calyx lobes; stamens slightly longer than the calyx lobes, filaments hairy; style 2-cleft, villous; ovary smooth; berry round, smooth, bluish black, about the size of a black currant. Lindley

described it* as having a "rich, subacid, vinous, rather perfumed flavor, which is extremely agreeable."

Found in the northwestern portion of North America.

15. R. DIVARICATUM, Dougl. (Fig. 87.)

Stems clustered, branches widely spreading, 5–12 feet (15–35 decimeters) long, nearly glabrous; thorns stocky, mostly single; leaves shining, minutely pubescent, roundish, 3–5 lobed, the lobes incisely toothed on long slender petioles; mostly less than 1 inch (25 mm.) in diameter; peduncles long, 2–4-flowered; pedicels slender and drooping, half an inch (12 mm.) long, with a small, broad bract at base; flower $\frac{3}{8}$–$\frac{1}{2}$ inch (10–13 mm.) long; calyx livid purple, slightly greenish without; petals white or purple-tinged, fan-shaped, the margins convolutely overlapping; filaments and 2-cleft villous style longer than the calyx lobes; anthers very short and broad, mostly in pairs; ovary smooth; berry small, glabrous, dark purple or black, agreeable.

Found from California to British Columbia, the variety extending eastward to the Rocky Mountains.

This species might well receive attention from horticulturists. The bush is comparatively free from thorns, the fruit of good size, fine flavor and perfectly smooth.

Coville† bases a variety *R. oxyacanthoides* var. *saxosum*, Hook., on the following characters: "Petioles usually with a few long, spreading, large, but rather flexuous, bristle-like hairs on the margins near the base, otherwise glabrous; leaves with a broad but well-marked sinus at the base, glabrous on both sides." This, I think, is a form of *R. divaricatum*.

16. R. ROTUNDIFOLIUM, Michx. (Fig. 88.)

Low shrub, much resembling *R. gracile;* branches commonly straight, with light colored bark; thorns mostly single, but very short, gray, like the outer bark; leaves wedge-shaped, deeply 3–5 lobed, smooth or slightly downy, ciliate on the margins and veins, petioles pubescent, the hairs sometimes glandular-tipped when very young, peduncles short, 2–3-flowered, rather slender like the pedicels; calyx lobes narrow or oblong, greenish or dull purplish, much shorter than in *R. gracile*, apparently seldom reflexed; petals obovate, small, filaments longer than the calyx lobes, style 2-cleft, villous; berry small, smooth, agreeable.

In the U. S. National Herbarium there occurs a small-leaved

*Bot. Reg. Aug., 1834. †Cont. U. S. Nat. Herb., 4:100.

Fig. 87. *Ribes divaricatum* (×⅔).
(Fruit ×½.)

Fig. 88. *Ribes rotundifolium* (×⅔).

Fig. 89. *Ribes leptanthum* (×1⅓).

form, with brown, irregular, thornless branches, rounded leaves 10–15 mm. in diameter, and small flowers with reflexed calyx-lobes. The leaves correspond much better to the name rotundifolium than do those of the more common form referred to this species. The plant seems to approach *R. curvata.*

Western Massachusetts and New York, southward to North Carolina along the Alleghanies.

This appears to be unknown in cultivation, owing, no doubt, to the small size of its fruit.

17. R. LEPTANTHUM, Gray. (Fig. 89.)

Sturdy, much branched, rigid shrub, 1–4 feet (3–12 decimeters) high, with grayish bark, and no prickles, thorns long, slender, single or triple, like the bark in color; leaves roundish, very small, ¼–⅝ inch (6–15 mm.) in diameter, 3 5-cleft, the lobes crenately toothed or incised, finely pubescent above and beneath; peduncles very short, 1–2-flowered; flower small, yellow or yellowish, calyx pubescent, outside tube cylindrical, long and narrow, equaling the lobes in length; petals broad, half the length of the calyx lobes; stamens just equaling the petals in length; anthers oval-oblong; style undivided, glabrous; exceeding the stamens; ovary glabrous; berry smooth.

Found in the Rocky Mountains of Colorado and New Mexico and mountains westward.

Judging only from the description* and a single specimen, there appears to be little reason for separating *R. quercetorum*, Greene, from this species. The form so described is found in California, and is said to have fragrant flowers, with yellow fruit.

18. R. COGNATUM, Greene.†

Described as follows: "Shrub evidently large and the branches not rigid; younger branches stiffly and densely setose-hispid, the 1–3 subaxillary spines short, not very stout; leaves, and especially the long and slender petioles, villous-pubescent; flowers 3–5, at the ends of long and slender pendulous peduncles; calyx salver form, the long cylindrical tube villous-pubescent, twice the length of the oblong segments, the whole apparently flesh-color; petals spatulate-obovate, truncate or retuse, not equaling the calyx segments; bracts of the raceme rounded or subreniform, glandular-ciliate; ovaries glabrous.

"River banks at Pendleton, Oregon, May 17, 1896, Thomas Howell. *R. leptanthum* is the nearest relative of this."

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*Bull. Cal. Acad. Sci. 1:83.

†Pittonia 3:115.

19. R. BRACHYANTHUM (Gray). *R. leptanthum* var. *brachyanthum*, Gray. *R. velutinum*, Greene.

Low, rigid, much-branched shrub with grayish or hoary bark, destitute of prickles; spines slender, sometimes nearly absent; leaves small, rounded, tomentose, and often glandular; peduncles short, commonly 1-flowered; flowers yellowish; calyx hirsute without, tube short, enlarged above the ovary, narrowing to the base of the lobes, lobes narrowly spatulate, reflexed in flower; ovary, and at least the young fruit, finely but densely pubescent.

Rocky Mountains and mountains westward.

This form long stood as a variety, but has evidently much better claim to specific rank than many other recognized species.

According to Coville* this plant is distinct from *R. velutinum*, Greene, and that opinion may be correct. Whatever the disposition made of them, they are apparently representatives of the same form, perhaps modified by geographical position.

20. R. LASIANTHUM, Greene.

Described as follows:† "Stout, low, widely spreading and intricately branched, the height seldom exceeding 2 feet, branches glabrous; infrastipular spines commonly 3, rather slender, straight; rounded leaves $\frac{1}{2}$–$\frac{3}{4}$ inch (13–20 mm.) broad, short-petioled, pubescent, cleft to the middle into 3 terminal lobes, with 2–4 more shallow and less distinct lateral or basal ones, all these 3-lobed at apex, the sinuses closed; flowers 3 or 4, in very short-peduncled racemes, yellow; calyx about 5 lines (10 mm.) long, the hirsute tube much dilated above the ovary, thence tapering gradually to the spreading spatulate lobes; petals also spatulate, shorter than the calyx lobes; young ovaries hairy; fruit unknown.

"An almost alpine species, flowering in the latter part of July, near the receding snow-drifts in the mountains of California above Donner Lake, toward Castle Peak."

Judging from the description only, this differs from *R. brachyanthum* chiefly, if not wholly, in the size of the flowers. In this connection it would be interesting to know whether altitude has any tendency to induce increase in size or lengthening of the floral parts.

21. R. IRRIGUUM, Dougl. (Fig. 90.) *R. leucoderme*, Heller.

Shrub 3–10 feet (1–3 meters) high, branches sometimes nearly

*Cont. U. S. Nat. Herb., 4:100.

†Pittonia, 3:22.

smooth but often densely covered with fine, straight, setose prickles; thorns generally 3, commonly long, slender, and somewhat ascending; bark for the most part gray or whitish, at least on younger branches; leaves deeply cordate, 3–5-lobed, coarsely and somewhat obtusely serrate, slightly pubescent, both above and beneath, commonly beset, especially on the under surface, with numerous minute resinous dots, which tend to disappear with age, ¾–1½ inches (2–4 cm.) broad; petioles pubescent, somewhat glandular and slightly ciliate, equaling or exceeding the leaves in length; peduncles 2- or 3-flowered, pubescent, pedicels short, subtended by short, rounded green bracts, which are commonly ciliate, with glandular-tipped hairs; flowers greenish white, narrowly campanulate, ⅜–½ inch (8–12 mm.) long, exclusive of the ovary; calyx lobes as long as the tube; petals obovate, white, half as long as the calyx lobes, stamens equaling or slightly exceeding the petals; fruit smooth, spherical, juicy, with a pleasant flavor.

From the northwest coast of the United States; eastward to the Rocky Mountains. Common in Washington.

Douglas says of this species, in connection with the original description:* "Of all the species which came under my observation during my journeys in America, this is the finest in the flavour of its berries, as well as in their size." Judging from this statement, and the apparent vigor of the plant, it is a species which might well receive attention from the horticulturist.

22. R. SETOSUM, Lindl. (Fig. 91.)

Branches commonly covered with slender prickles, which later scale away with the bark; thorns often several in a whorl; leaves cordate, 5–7-lobed, the lobes incised, together with the petioles minutely pubescent; calyx tube cylindrical, about ⅛ of an inch (3 mm.) long, exclusive of ovary and lobes; petals as long as the stamens; style commonly 2-cleft, villous; berry dark purple, sour, sometimes hispid.

Northwestern Nebraska, west and northward to Ontario.

This appears to be the gradation species between *R. oxyacanthoides* and *R. irriguum*. Though the typical form is very distinct, it is so gradually approached by *R. oxyacanthoides* on the Plains that it is at times difficult to separate them.

23. R. OXYACANTHOIDES, Linn. (Fig. 92.) Common Gooseberry.

Low shrub, 2–4 feet (6-12 decimeters) high, branches slender,

*Trans. London, Hort. Soc. 7:516.

Fig. 90. *Ribes irriguum* (×1).

Fig. 91. *Ribes setosum* (×1).

Fig. 92. *Ribes oxyacanthoides* (×⅔).

reclined, but often crooked, reddish brown, covered with scaly gray bark when young, commonly smooth, but sometimes with scattered prickles, thorns single or triple, rather slender and very finely pointed, ¼-⅜ inch (6–10 mm.) long, sometimes nearly or quite wanting; leaves thin, roundish, varying from cuneate to cordate, deeply 3–5-lobed, the lobes incised and coarsely toothed, finely pubescent above and beneath, but commonly glossy when growing; peduncles very short, 1–2-flowered; calyx greenish white, smooth or pubescent without, tube campanulate, lobes oblong or obovate, thin and petal-like, generally equaling or slightly exceeding the stamens in length; petals broadly ovate or spatulate, reaching half way to the anthers; style single or 2-cleft, villous below, slightly longer than the stamens; ovary glabrous; berry round, perfectly smooth, but with a delicate bloom, small or medium sized, yellowish green or reddish when ripe.

Original distribution:—Newfoundland to New Jersey and westward to the Rocky Mountains.

Fig. 93. *Ribes grossularia* (×1).

Koehne* retains the name *R. hirtellum* (Michx.) for the more common eastern form, with mostly single thorns, rounded leaves and longer stamens, reserving the name oxyacanthoides for what appears to be a more common northwestern form, with somewhat heart-shaped leaves, more numerous thorns, and longer calyx tube. Those who adhere to a close conception of species will doubtless prefer this classification.

R. oxyacanthoides may not be the most promising native goose berry, but to-day it stands preëminent in American horticulture.

24. R. GROSSULARIA, Linn. European Gooseberry. (Fig. 93.)
R. uva crispa, Linn.

Bush stocky, rigid; branches thick, the fruiting ones without

* Deutsche Dendrologie, 199.

prickles; thorns mostly triple, heavy and thick at the base, the central one $\frac{3}{8}$–$\frac{1}{2}$ inch (10–13 mm.) long; leaves thick and very glossy, pubescent; petioles sometimes sparsely beset with glandular-tipped hairs; peduncles short, 1–2-flowered, pubescent or glandular; calyx strongly pubescent, greenish, tube broad, bell-shaped; lobes broadly ovate, thickish and leaf-like; petals obovate, reaching to the base of the anthers; stamens shorter than the calyx lobes; style commonly 2-cleft, villous at base: ovary pubescent or glandular; berry generally oval, large, green, yellowish green or red, minutely but roughly pubescent, often with scattered prickles or glandular-tipped hairs also.

Original Distribution.—Europe, northern Africa and western Asia. Linné applied the name uva crispa to the smooth-fruited form.

Botanically, the American and European gooseberry differ but little. The above characters appear to separate wild forms, but may not be constant in cultivation. Horticulturally the two species differ much. This is the parent of the English gooseberries. It is widely cultivated throughout Europe, and endless varieties have been produced. Thory* describes and illustrates by colored plates no less than fifteen forms which he ranks as botanical varieties.

25. R. CYNOSBATI, Linn. (Fig. 94.)

Compact shrub, 2–4 feet (6-12 decimeters) high; branches commonly smooth, sometimes beset with fine, slender, reflexed prickles; thorns commonly single, slender, fine pointed, $\frac{3}{16}$–$\frac{3}{8}$ inch (5–10 mm.) long; leaves 3–5-lobed, coarsely and bluntly toothed; petioles long and slender, pubescent, and bearing glandular-tipped hairs; peduncles long, filiform, 1–2-flowered, pubescent and glandular; flowers small, greenish, calyx tube broadly bell-shaped; lobes narrow, oblong, acute, half as long as the tube; petals minute, half as long as the calyx lobes; stamens shorter than the calyx; style single or 2-cleft, slightly longer than the stamens; ovary glandular-hispid; berry large, generally prickly, reddish purple.

New Brunswick to the mountains of North Carolina and westward to the Rocky Mountains.

This is a promising species. As found wild, its fruit is larger than that of *R. oxyacanthoides*, often reaching half an inch in diameter. Though generally prickly, plants with smooth fruit

*Monographie ou Histoire Naturelle du Genre Grosseillier.

often occur. Reports from the Arnold Arboretum* state that individual plants raised from seed collected from the same plant may produce either smooth or prickly fruit. The berries are rather thick skinned when mature, but sweet and pleasant. The

Fig. 94. *Ribes cynosbati* (×1½).

Fig. 95. *Ribes lacustre* (×1).

plants are generally prolific, and are less prickly than those of *R. oxyacanthoides*, being almost free from thorns in some cases.

26. R. WATSONIANUM, Kœhne. *R. ambiguum*, Watson,† not Maximowicz.

Young branches somewhat thick and soft, sometimes sparsely beset with weak prickles, which cleave away with the bark; spines commonly three or more in a whorl, slender, yellowish, the center one longer than the others, young parts glandular pubescent and villous; leaves 1–2 inches (2½–5 cm.) in diameter, roundish heart-shaped, deeply 3–5-lobed, bearing short hairs both above and below; petioles long, slender, prominently ciliate; calyx tube broadly campanulate or hemispherical, shorter than the lobes,

*Garden and Forest, 7:315.

†Proc. Amer. Acad. Arts and Sciences, 18:193.

greenish white, exceeding the stamens; stamens roundish, blunt, as long as the petals; ovary and fruit densely covered with very long slender prickles, as in *R. Californicum*.

Mountains of northern California and Washington.

This species is the western representative of *R. cynosbati*, but its fruit appears to be more densely covered with longer and more slender spines.*

27. R. PINETORUM, Greene.†

Bush 5–6 feet (15–25 decimeters) high, sparingly branched and few-flowered; branches somewhat zigzag, smooth, thorns slender, 1 to several in a whorl; petiole long and slender; leaves thin, smooth or barely pubescent; peduncles short, erect, mostly 1-flowered; flowers greenish or reddish yellow, ½–⅝ inch (12–16 mm.) long; calyx tube cylindrical, about as long as the lobes; lobes spatulate, reflexed, longer than the stamens; petals and stamens equal in length; anthers short and blunt; style glabrous, undivided; ovary and berry thickly beset with prickles; berry large and well flavored. Flowers in April; fruit ripens in September.

Described from New Mexico.

28. R. LACUSTRE (Pers.), Poir. Lake or Swamp Gooseberry. (Fig. 95.)

Upright shrub, the twigs and branches beset with straight, slender prickles; thorns weak, single, or several in a whorl, especially on young growth; leaves heart-shaped, 3–5-parted, with the lobes deeply cut, especially on young shoots; petioles long, slender, glandular pubescent; peduncles long, filiform; pedicels short, calyx open, flat, the tube nearly wanting, lobes broad, greenish white; petals fan-shaped, reddish, nearly as long as the calyx lobes; stamens short, anthers very short, each half divided; pistil cleft at summit; ovary glandular hairy; berry small, bristly, unpleasant.

From New England, through Michigan, Minnesota and the Rocky Mountains to northern California and far northward.

Westward the species becomes smaller. In the Rocky Mountain region it is commonly glabrous (var. parvulum, Gray), and toward the Pacific the leaves become downy pubescent and glan-

*In Fascicle 2 of "A Flora of Northwest America," which has just appeared, the author, Thomas Howell, describes a form found in the Siskiyou Mountains under the name *R. montanum*. This name cannot stand should the species prove valid, since it has already been applied to a South American species.

†Bot. Gaz. 6:157.

dular (var. molle, Gray). This pubescence in some cases becomes so pronounced and viscid as to stain the collecting sheets (var. lentum, Jones). This is an interesting type, because intermediate between the currants and gooseberries, but it appears to possess no horticultural merit.

29. R. MONTIGENUM, McClatchie. *R. nubigenum*, McClatchie.

"Shrub 1-2 feet (3-6 decimeters) high, with numerous rigid, spreading branches, armed with strong triple spines below the leafy fascicles, 3-5 lines (6-10 mm.) apart; outer bark smooth and light brown on 1- or 2-year-old branches, but becoming loose and silvery with age; leaves and inflorescence hirsute, some of the hairs bearing glands; leaves ¼-½ inch (6-12 mm.) broad, deeply 5-parted, the lobes incised and toothed; racemes 3-6-flowered, bracts cordate, acuminate; calyx about ¼ inch (6 mm.) broad, its rounded lobes spreading from place of insertion on ovary; petals minute; stamens less than a line (2 mm.) long; anthers broader than long, deeply lobed; red berries, glandular, hirsute, 2-3 lines (4-6 mm.) in diameter, containing 1-3 large seeds."—McClatchie, Erythea, 2:80.

Described from the summit of Mt. San Antonio, southern California, at an altitude of 10,000 feet. It is evidently closely related to *R. lacustre*. The plant is very thorny and rugged, with the thorns in whorls.

30. R. MULTIFLORUM, Kit.

Shrub 3-4 feet (9-12 decimeters) high, with upright, spreading branches; younger twigs, petioles and peduncles pubescent, bearing scattered glandular-tipped hairs; leaves long-petioled, roundish, mostly 5-lobed, dark green and glabrous above, whitened downy beneath; racemes long, dense, pendulous; flowers small, green or reddish green; calyx tube broadly bell-shaped, short; stamens and 2-cleft style longer than the reflexed calyx lobes; fruit dark red, as large as a good-sized pea.

Original distribution.—Southeastern Europe.

This species has long been in limited cultivation in Europe, but is little known in the United States. It is grown at the Arnold Arboretum* and reported as a handsome and interesting shrub, worthy of more general culture.

31. R. PROSTRATUM, L'Her. Fetid Currant. (Fig. 96.)

Stems long, prostrate, trailing and rooting; branches erect,

*Garden and Forest, 1:189.

greenish gray or brownish; leaves heart-shaped, 5–7-lobed; petioles long, slender; racemes erect, slender; bracts small; flowers small; calyx flattish; lobes obovate or roundish, greenish white or purplish; petals spatulate or fan-shaped, small, together with the anthers often purple, shorter than the calyx lobes; stamens slightly longer than the petals, and stout, 2-cleft style; filaments thick; ovary, pedicels and peduncles covered with glandular-tipped hairs; berry glandular, hispid.

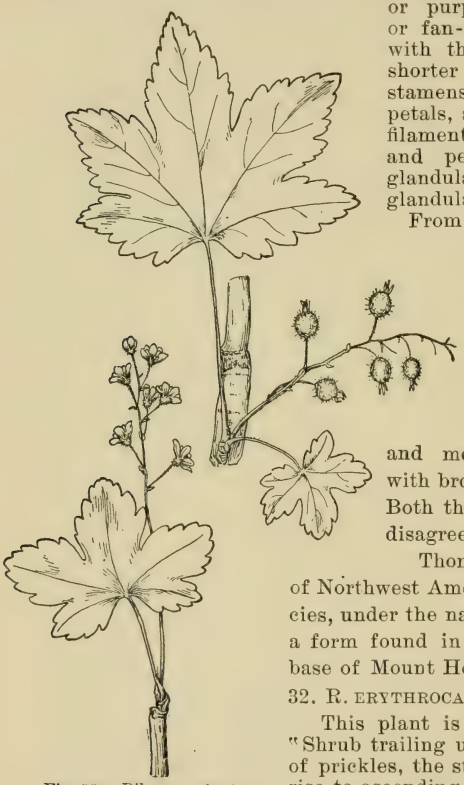

Fig. 96. *Ribes prostratum* (×⅔).

From Labrador to the mountains of North Carolina, and westward to the Pacific Ocean; also in northeastern Asia, upon the islands of Saghalien and Yesso.

West of the Rocky Mountains the flowers become somewhat larger and more commonly purple, with broader fan-shaped petals. Both the plant and fruit emit a disagreeable odor when bruised.

Thomas Howell, in "A Flora of Northwest America," erects a new species, under the name *R. ciliosum*, to cover a form found in marshy ground at the base of Mount Hood.

32. R. ERYTHROCARPUM, Coville & Leiburg.

This plant is described* as follows: "Shrub trailing upon the ground, devoid of prickles, the stems rooting and giving rise to ascending branches commonly 10–20 centimeters in height, the herbage and inflorescence clothed with short glandular hairs; leaves angulate-orbicular in outline, rugose, commonly 2–3.5 centimeters in diameter, on petioles nearly

*Proc. Biol. Soc. Wash., 10:132.

as long, 3–5-lobed, the sinuses extending one-half to two-thirds the way to the base, the lobes coarsely crenate and the crenatures unevenly but finely dentate-serrate; racemes erect, commonly 10–20-flowered, the bracts herbaceous, lanceolate to obovate, commonly 2–4 millimeters long, persistent; flowers erect, contiguous, when expanded 6–8 millimeters in diameter, on pedicels equaling the bracts; ovary beset with short glandular hairs; calyx not produced into a tube, the spreading lobes oblong, obtuse or broadly acute, yellow minutely dotted with red, therefore appearing salmon-colored, sparingly and minutely pubescent without, glabrous within; petals broadly spatulate, glabrous, one-third to one-half the length of the calyx lobes and similar in color; filaments glabrous; style glabrous, 2-parted; fruiting racemes erect or sometimes declined by the weight of the berries; fruit on erect pedicels, scarlet, subpyriform to spherical, commonly 8-10 millimeters in length, provided with short glandular hairs, the flesh white or translucent, insipid."

Collected in the vicinity of Crater Lake, Oregon.

The authors state that the plant appears, from the structure of its flowers, to be most nearly related to *R. laxiflorum*, from which it is distinguishable by its creeping habit and its glandular pubescence. In the latter character and in general appearance it resembles *R. viscosissimum*, though possessing the rank odor of *R. prostratum* and *R. Hudsonianum*, which is quite distinct from the citronella-like smell of *R. viscosissimum*.

33. R. RUBRUM, Linn. Garden Currant. (Fig. 97.)

Stems straggling or reclined; branches thick and stocky; leaves somewhat heart-shaped, pubescent when young, becoming glabrous, moderately 3–5-lobed, the lobes roundish, serrate, the teeth mucronate; petioles broadened at the base, pubescent, commonly with scattered, short, glandular-tipped hairs; racemes drooping, produced from lateral buds distinct from the leaf-buds; flowers small, yellowish green or purplish; calyx-tube broad, saucer-shaped; lobes roundish; petals minute; stamens and style very short, the latter 2-cleft; fruit round, shining, thin-skinned, bright red, yellowish white, or even striped.

Original distribution.—New England, west to Minnesota and far northward; also in northern and middle Europe, the Orient and Caucasus, Siberia, Manchuria and northern Japan to Kamschatka.

Slight geographical variations occur, and all native North American forms have been referred to a separate variety (var. subglandulosum, Maxim.), but apparently without sufficient reason. In cultivation, numerous variations occur, both in character

Fig. 97. *Ribes rubrum* (×⅔).

of fruit and foliage. The species is the parent of all our red and white currants, and appears to thrive equally well in either hemisphere.

34. R. ALPINUM, Linn. Tasteless Mountain Currant. *R. saxatile*, hort., not Pall. (Fig. 98.)

Low shrub, 2–3 feet (6–9 decimeters) high; branches upright, whitish; leaves 3–5-lobed, the lobes coarsely incised serrate, acute, slightly hairy on the upper surface, the petioles commonly bearing short, scattered, glandular-tipped hairs; flowers small, yellowish green, dicœcious, staminate clusters long, 20–30 flowered, pistillate clusters shorter, 5–10-flowered; pedicels short; bracts

longer than the pedicel and flower, like the peduncle, bearing short, glandular-tipped hairs; calyx flat, lobes ovate; petals very minute; fruit smooth, scarlet, insipid or sweetish.

Original distribution.—Mountains of Europe and the Orient, in Siberia, Turkestan, Manchuria and Japan.

Said to be in limited cultivation for fruit in parts of Europe, improved forms, with both red and black fruits, being known. It has been grown at the Arnold Arboretum, and is reported* to possess some ornamental value.

35. R. VIBURNIFOLIUM, Gray. (Fig. 99.)

A straggling bush, altogether unlike other members of the genus; bark grayish, cracking away in rings; twigs, peduncles, petioles and under surface of the leaves beset with bright yellowish, resinous dots; leaves broadly ovate or roundish, obtuse, scarcely or not at all 3-lobed, sparsely crenate or dentate, the teeth mucronate, thick, with a peculiar pebbled, leathery appear-

Fig. 99. *Ribes viburnifolium* (×¾).

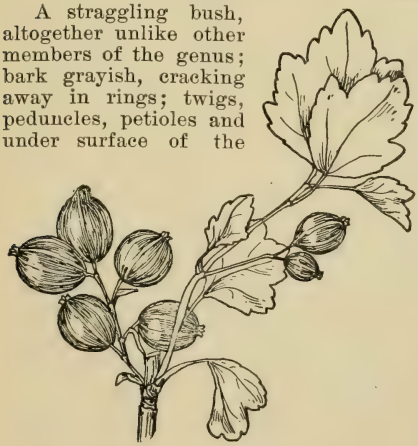

Fig. 98. *Ribes alpinum* (×1).

*Garden and Forest, 6 : 245.

ance; petioles pubescent; racemes upright, corymbose; pedicels long filiform, the lower ones compound; flowers small; calyx-tube flat; lobes ovate or oblong, rose colored, several times as long as the tube; petals minute; stamens and 2-cleft style very short; berry apparently smooth or leathery.

Northern part of Lower California and islands of southwestern California.

36. R. LAXIFLORUM, Pursh. *R. Howellii*, Greene. *R. acerifolium*, Howell.

Stems ascending, 3–8 feet (9–24 decimeters) long, unarmed; leaves 2–3 inches (5–7.5 cm.) in diameter, cordate, or sometimes truncate, mostly 5-lobed; lobes doubly and somewhat finely and sharply incised, bearing very minute resinous dots beneath; petioles long and slender, dilated and ciliate with glandular-tipped hairs at the base; shoots subtended by prominent scarious bracts; racemes, ovary and calyx glandular pubescent; bracts slender, as long as the pedicels; petals minute, red, spatulate; calyx-tube broad, saucer-shaped; lobes broadly obovate or spatulate; anthers very short and broad; filaments flattened; style deeply 2-cleft; fruit purple or black, sparingly glandular bristly.

Oregon and Washington.

This is apparently a western ally of *R. prostratum*, differing from that species chiefly in the longer bracts, larger calyx-lobes, and the resinous dots on the under surface of the leaves.

37. RIBES HUDSONIANUM, Rich.

Upright shrub, 3–4 feet (9–12 decimeters) high; branches erect, thick, the bark scaling off in thin, papery layers; leaves large, coarsely incised or serrate, nearly glabrous above, with minute resinous dots beneath; petioles long, broadened toward the base, minutely pubescent; racemes erect, long, narrow, many-flowered; pedicels short; bracts minute, deciduous; calyx-tube short; lobes lanceolate-oblong, pubescent, whitish, resinous dots extending from the outer surface of the lobes to the peduncles, being thickest on the ovary and pedicels; petals small, obovate, one-fourth as long as the calyx-lobes; stamens as long as the petals; style single or 2-parted; fruit round, black, glabrous.

Hudson's Bay to the Rocky Mountains, Oregon and northward.

In the mountains of Oregon the calyx becomes nearly glabrous and the racemes longer (var. B., Hook.). This species resembles *R. nigrum* in its fruit and the odor of the plants.

38. R. BRACTEOSUM, Dougl.

Tall, upright shrub, 4 10 feet (12-30 decimeters) high, almost glabrous, at least with age, the smaller parts sprinkled with

resinous dots; leaves large, 3–9 inches (8–25 cm.) in diameter, 5–7 cleft, the lobes ovate or narrower, acute or acuminate, coarsely and doubly serrate, the upper side rough, hairy, with scattered resinous dots, under side smooth, with dots numerous; petioles long; racemes erect or ascending, sometimes terminal, many-flowered, 4–8 inches (10–20 cm.) long, in fruit often much longer and loose; bracts persistent, filiform to spatulate, or the lower foliaceous and petiolate, sometimes passing into leaves; pedicels erect, pubescent; flowers greenish white or yellowish purple, inconspicuous; calyx-lobes roundish or oval; stamens short; style 2-cleft; berry black, resinous, dotted, ⅓ inch (8 mm.) in diameter, resembling *R. nigrum* in flavor. Northern California to Sitka.

39. R. NIGRUM, Linn. European Black Currant. (Fig. 100.)

Upright shrub, with thick, grayish branches; leaves heart-shaped, 3–5-lobed, or incised, coarsely serrate, the teeth mucronate, sometimes broader than long, the under side sprinkled with minute bright yellow resinous dots; petiole long, slender, minutely pubescent; racemes drooping, 5–10-flowered, bracts minute; pedicels short; flowers greenish white, short and broad; calyx-tube broadly urn-shaped, pubescent and resinous dotted; lobes small, oval, thick and greenish; petals and stamens nearly as long as the calyx lobes; ovary pubescent and resinous dotted; berry round, black, larger than red currant, mawkish flavor.

Fig. 100. *Ribes nigrum* (×⅔).

Original distribution.—Middle and northeastern Europe, through northern Asia to Manchuria and northern China.

The species varies widely, and numerous botanical varieties are noted based on characters of fruit or foliage. Forms occur in which the leaves are deeply slit, or parted to the midrib. In others, the fruit is yellowish green or whitish.

Extensively cultivated in Europe. The plant emits a strong, peculiar odor when wounded.

40. R. CEREUM, Dougl. (Figs. 101, 102.)

Upright, much-branched shrub, 1–3 feet (3–9 decimeters) high; stem and older branches smooth, gray or brownish; smaller branches short, minutely pubescent, commonly glutinous, becoming rough or warty; leaves roundish or kidney shaped, ½–1 inch

Fig. 101. *Ribes cereum* (×⅔)

(12–25 mm.) in diameter, somewhat 3–5-lobed, crenately toothed, firm in texture, with minute white waxy dots on one or both sides; petioles pubescent; racemes short, drooping, compactly 3–5-flowered, pubescent, and beset with glandular-tipped hairs which extend to the bracts and ovary; pedicels very short; bracts oval or broad and leaf-like, incised at the tip, closely covering the pedicel and ovary; flowers small; calyx-tube narrow, ¼–½ inch (6–12 mm.) long, somewhat angular, pubescent, nearly white, or pinkish at the base; lobes short, ovate, reflexed; petals minute, orbicular; stamens concealed within the calyx-tube; style slightly exceeding it, 2-parted at the tip; berry of medium size, bright red, somewhat glandular, sweet, but not agreeable.

From New Mexico northward through the Rocky and Sierra Nevada Mountains to British Columbia.

The flowers are commonly almost sessile, but a form from Montana has slender pedicels, longer than the bracts (var. pedicellare, Gray).

41. R. VISCOSISSIMUM, Pursh. (Fig. 103.)

Large, branching bush, 2–6 feet (6–18 decimeters) high, stem and older branches smooth, dark red, young shoots pubescent and viscid-glandular; leaves round-cordate, 1–3 inches (2.5–8 cm.) wide, distinctly 3–5-lobed, lobes roundish, doubly crenate, somewhat incised, more or less rugose and veiny, glandular pubescent above and below, emitting a peculiar scent, likened to old apples,

Fig. 102. *Ribes cereum* (×1).

when touched; petioles long; racemes erect, covered with viscid glandular pubescence, which extends to the calyx tube; bracts linear-oblanceolate, entire or slightly incised at tip, as long as the pedicels; pedicels commonly ¼–½ inch (6–12 mm.) long; flowers large, fragrant; calyx yellowish or whitish green, tube broad, campanulate or ventricose, lobes oblong, nearly as long as the tube, spreading but not reflexed; petals ovate, white, shorter than the calyx lobes; stamens and pistil hidden within the flower; fruit ovoid, black, rough, glandular-hairy or rarely smooth, flavor unpleasant.

High altitudes of the Rocky and Sierra Nevada Mountains in the northern portion of the United States and southern British America.

Douglas says* that the berries are so musky or mawkish that two or three will produce vomiting, though it has since been pronounced edible.

* Trans. Lon. Hort. Soc. 7:511.

42. R. SANGUINEUM, Pursh. Red-flowered Currant. (Fig. 104.)

An erect, branching shrub, 2–12 feet (1–4 meters) high with red, smooth branches; young twigs and petioles pubescent or glandular-hairy; leaves round-cordate, 2–4 inches (5–10 cm.)

Fig. 103. *Ribes viscosissimum* (×⅔).

broad, 3–5-lobed, doubly serrate, minutely pubescent above, downy or smooth beneath, petioles long, dilated and ciliate at base; racemes long, pendulous; bracts obovate, red or whitish, membranous, usually as long as the pedicel; calyx tube campanulate or short cylindrical, lobes obovate, broad, about as long as the tube, purple-red or rose-colored; petals spatulate, commonly white, somewhat shorter than the calyx lobes, equaling the

stamens; style 2-cleft at apex, glabrous, slightly exceeding the stamens; ovary beset with short, glandular-tipped hairs, which extend upward to the calyx and downward to the peduncles; fruit bluish black, generally rough, glandular-hairy, tough, dry and bitterish. A variable species.

Var. VARIEGATUM, Watson.

Described as low, nearly glabrous; racemes short and dense, ascending, barely glandular; calyx tube broadly campanulate, not longer than the lobes, rose color, with the petals white, the whole flower only 3 lines (6 mm.) long. Available specimens in fruit

Fig. 104. *Ribes sanguineum* (×⅔).

indicate a slightly thicker and more leathery leaf, decidedly downy beneath, a somewhat loose, erect, few-flowered cluster, with deciduous bracts. This form is well marked, and perhaps ought to stand as a separate species, being so recognized by some, under the name *R. Nevadense*, Kellogg.

What appears to be the eastern representative of the same form was described from Colorado by Rothrock,* under the name *R. Wolfii*. Judging from the description only, this differs somewhat from the western form, and perhaps ought to be recognized as a separate variety, or possibly even as a distinct species.

Original distribution.—From southern British Columbia, through California, eastward to the Rocky Mountains, in the form Wolfii,

* Amer. Nat. 8:358.

and southward along the mountains of the Pacific coast through Mexico and South America.

Numerous forms appear in cultivation, some of which have received varietal names among horticulturists. The most important are var. albidum, with whitish, dirty yellow, or yellowish red flowers, and even white fruit;* var. atrorubens, with dark, blood-red flowers, and var. flore pleno, with dark, clear, double flowers.

Fig. 105. *Ribes Gordonianum* (×⅔).

This is a handsome currant, and is generally prized for ornament, both in Europe and America. An excellent colored plate appears in the Transactions of the London Horticultural Society, Vol. vii, p. 509. In its native habitat, the woods are gay with its bloom in springtime.

43. R. GLUTINOSUM, Benth.

Young growth more glandular and less pubescent than *R. sanguineum;* leaves large, 2–6 inches (5–15 cm.) broad, not deeply lobed, somewhat resembling the leaves of *Rubus odoratus*, not downy; racemes long, many-flowered; calyx tube narrowly bell-shaped, lobes thin, membranous, much longer than the stamens; ovary glandular, but apparently becoming nearly smooth when mature; fruit as large as a gooseberry.

California and the Pacific coast.

According to Prof. E. L. Greene, this species blooms in January, and sanguineum in March.

44. R. GORDONIANUM. (Fig. 105.)

This is a hybrid between *R. sanguineum* and *R. aureum*, which is said to have been raised in England many years ago. It is intermediate between the two in character. The flowers resemble those of *R. sanguineum* in shape, but are lighter colored, somewhat like faded ones of that species; they are produced in showy

*Popular Gardening 4:10, Figure.

racemes, and are nearly odorless. The bush resembles that of *R. aureum*, and is generally fruitless. It is intermediate between the two species in hardiness, being commonly injured at the Arnold Arboretum,* though reported perfectly hardy at Rochester, N. Y.†

45. R. MALVACEUM, Smith. (Fig. 106.)

More rigid and compact than *R. sanguineum*, 3–6 feet (1–2 meters) high, all young parts, including the peduncles and flowers, villous-tomentose and beset with short, glandular-tipped hairs; leaves thick, 1–2 inches (2.5-5 cm.) broad, rugose, the upper side hispid, with short, glandular-tipped hairs, under side white tomentose, somewhat 3–5-lobed, finely and doubly serrate; petioles short, but slightly dilated or ciliate at base, sparingly beset with short, glandular hairs, which extend to the veins beneath; racemes short and dense, the flowers small, nearly sessile, yellowish white or flesh colored; bracts ovate-lanceolate, tomentose and glandular; calyx tube narrow, cylindrical, and broadest just above the ovary, lobes small, short, not over half as long as the tube; petals minute, white, roundish, or subreniform; style shorter than the stamens, undivided, villous; berry oval, ⅓ of an inch (8 mm.) long, purple, glaucous, pulp soft and sweet.

On the coast ranges from San Francisco Bay southward.

Although resembling *R. sanguineum*, it is less ornamental than that species, the flowers being much smaller, with less color and borne in shorter and denser racemes.

46. R. TORTUOSUM, Benth.

Small, much branched shrub, flowering before the leaves appear; branches short, often tortuous, with smooth, ashy gray bark; leaves few and small, cordate at base, 5-lobed, the younger puberulent; bracts minute, half as long as the pedicels; racemes terminal, ½–1 inch (12–25 mm.) long, 8–15-flowered, minutely puberulent, subtended by persistent brown scales; pedicels spreading, 2–4 millimeters long; calyx tube cylindrical, glabrous, about 4 millimeters long; lobes ovate, reflexed, half as long as the tube; petals ovate, half as long as the calyx lobes; stamens as long as the petals; style slightly 2-cleft at apex; fruit small, apparently glandular, black and dry.‡

Confined to southern California.

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*Garden and Forest 6:245.

†Horticulturist 1854:142.

‡Described from an imperfect specimen, supplemented by description given by Walpers, Repertorium, 5:822.

Fig. 106. *Ribes malvaceum* (×⅔).

Fig. 107. *Ribes Americanum* (×½).

R. Palmeri, V. & R., may belong here. I have neither had access to the description nor specimens, but imperfect specimens in the herbarium of the Missouri Botanic Garden, labeled Palmeri, have been referred to tortuosum.

47. R. AMERICANUM, Mill. *R. floridum.* L'Her. Wild Black Currant. (Fig. 107.)

Bush low and spreading, 2–5 feet (6–15 decimeters) high; branches long and somewhat drooping, slightly angular; leaves sharply 3–5-lobed, the lobes acute, coarsely and doubly serrate, bearing bright yellow resinous dots, few on the upper, many on the lower side, scarcely pubescent except the petioles and veins beneath; racemes long, pendulous, many-flowered; peduncles, bracts and pedicels downy-pubescent without glandular-tipped hairs, bracts linear, longer than the pedicels; flowers greenish white or yellow, ¼–⅜ inch (6–10 mm.) long; calyx tube bell-shaped or gradually broadening, barely pubescent, but not resinous, dotted; lobes large, obovate, pubescent, but thin, petal-like; petals and stamens nearly as long as the calyx lobes; ovary smooth; fruit medium sized, roundish oval, smooth, black, similar to the European black currant in flavor.

Nova Scotia and New England, south to Virginia, and westward to Colorado and Manitoba.

This species is seldom cultivated, but apparently deserves to be. It forms a graceful, spreading bush, with luxuriant light green foliage and long drooping racemes. Dippel,* under the name *R. intermedium*, describes a hybrid between this species and *R. nigrum*, which has long been in cultivation in Bohemian gardens.

48. R. MOGOLLONICUM, Greene.

This is described as follows:† "Glabrous and sparingly glandular, 6–10 feet (18–30 decimeters) high; leaves 1–3 inches (2.5–7.5 cm.) wide, 5-lobed; the lobes triangular, doubly serrate; petioles one inch long; racemes few-flowered, subcapitate, on erect peduncles which surpass the petioles; bracts rhombic-ovate, the lowest somewhat spatulate, their margins glandular; flowers small; ovaries clothed with stalked glands; calyx-tube very short; sepals ovate-oblong, campanulate-spreading, greenish and marked with dark green or purplish veins; petals white, spatulate, very small; berry smooth, black, edible."

*Handbuch der Laubholzkunde, 3:296.

†Bull. Torrey Bot. Club, 8:121.

Collected on the Mogollon Mountains, New Mexico.

This is plainly the western representative of *R. Americanum*. It appears to differ chiefly in the shorter and more erect racemes,

Fig. 108. *Ribes aureum* (×½).

Fig. 109. *Ribes aureum tenuiflorum* (×⅔).

and in the glandular character of the ovaries and margins of the bracts.

49. R. AUREUM, Pursh. Missouri, Flowering, Golden, or Buffalo Currant. (Fig. 108.)

Free-growing shrub, 4–6 feet (1–2 meters) high, sprouting from the roots; branches graceful and drooping; young shoots very minutely pubescent; leaves firm, smooth and shining, densely covered,

when very young, with brown or yellow resinous beads which disappear with age; leaves of young shoots sharply and deeply 3–5-lobed, the lobes coarsely and somewhat sharply toothed, truncate, or very broadly wedge-shaped at base, 1½–2 inches (4–5 cm.) broad, resembling maple leaves in form; leaves of bearing shoots smaller and narrower at base, commonly 3-lobed, the lobes often short, broad and entire; peduncles short, few-flowered, emerging from clusters of leaves; bracts large, leaf-like, commonly exceeding the pedicels; flowers spicy-scented, yellow and showy; calyx-tube ⅜–½ inch (10–12 mm.) long, narrow and glabrous, lobes spreading, broad, obovate or oblong, obtuse, one-third as long as the tube; petals obovate, erose, red, ⅓–½ as long as the calyx-lobes; stamens spreading and alternating with the petals; style longer, undivided; fruit round or oval, dark brown or black, commonly with a bluish bloom, flavor peculiar.

Var. TENUIFLORUM* (Lindl.), Torrey. (Fig. 109.)

Taller, leaves thick, light green, broadly 3–5-lobed, racemes longer and more loosely flowered; flowers scentless; berries amber colored, approaching a pale cherry-red when fully mature, acidulous, without aroma.

Original distribution.—From the Mississippi Valley westward to the Rocky Mountains. The variety from somewhat east of the Rocky Mountains to the Pacific coast.

For the position of *Ribes aureum* in cultivation, see Chapters XIV and XV.

Many synonyms for the preceding species are to be met with in horticultural and botanical writings. The following are added, either on account of having been mentioned in American horticultural literature, or because not easily found elsewhere.

R. acerifolium, hort.=rubrum.
R. Beatonii, hort.=Gordonianum.
R. dikuscha, Tisch.=nigrum.

*Professor Greene considers this western form a distinct species, but Professor Piper, of Washington, writes that he has seen forms with red fruit, with yellow fruit, and with black fruit growing close together, and that all had distinctive flavors. The form described by Rydberg (Flora of Nebraska, Part 21:71) as var. chrysococcus, probably belongs to this variety.

R. flavum, Colla = aureum.
R. leiobotrys, Koehne = aureum.
R. Loudoni, hort. = Gordonianum.
R. migratorum, Suksdorf = rubrum.
R. Missouriense, hort. = Americanum.
R. odoratum, hort. = aureum.
R. resinosum, Pursh. = orientale.
R. Rusbyi, Greene, in Nat. Herb. = pinetorum.
R. saxatile, hort. = alpinum.

HYBRIDS

Numerous hybrids have been produced in the genus Ribes, the best known being the one known as *R. Gordonianum (R. aureum × sanguineum)*. Focke* mentions two forms of *R. nigrum × sanguineum;* also a probable hybrid between *R. aureum* and *R. Americanum*.

Prof. William Saunders† has produced hybrids between the black currant and gooseberry, also between the black and white currant.

* Die Pflanzen-Mischlinge, p. 151.
† Trans. Roy. Soc. Canada, 1894:129–142.

Part IV

MISCELLANEOUS TYPES

CHAPTER XIX

OTHER SPECIES OF BUSH-FRUITS

Although the foregoing pages describe all the bush-fruits which have any commercial importance in cultivation, there are certain other types which are either coming into domestication or which are occasionally seen in private gardens. To these we shall now give attention.

BUFFALO BERRY

LEPARGYRÆA ARGENTEA (Nutt.), Greene. *Shepherdia argentea*, Nutt.

The buffalo berry is a thorny, deciduous shrub, growing from 5–20 feet high, with a whitened or silvery appearance throughout. Its leaves are narrow, 1–1½ inches long, pointed at the base, entire, and silvery white on both sides. The flowers are small, yellow and dicœcious. The fruit is round or ovoid, scarlet, or more rarely yellow, with a single smooth seed, and a sprightly acid and agreeable flavor. It is borne in very compact clusters in the axils of the small branches, ripening in July, but remaining on the bushes till frost, or later. The plant occurs throughout the Plains, westward to the Sierra Nevada Mountains, and from the Saskatchewan southward to the mountains of New Mexico.

The name buffalo berry is said to have been derived from the

custom of eating the berries as a sauce with buffalo meat. It has also been known as rabbit berry and blood berry, while Crozier states* that it has even been improperly called cornelian cherry. A writer in the Gardener's Monthly† speaks of it as the Nebraska currant.

The buffalo berry has enjoyed the distinction of remaining a new fruit for a very long time. In 1841 William Oakes, in discussing the advance of spring in eastern Massachusetts, mentions the buffalo berry, and incidentally states that it was then frequently cultivated. This was the same year that our earliest cultivated blackberry made its first appearance on the exhibition tables of the Massachusetts Horticultural Society, and some years before either the black raspberry or the blackberry came into general cultivation. Yet we are still talking about the buffalo berry as a new fruit which ought to be introduced. Fuller, in his "Small Fruit Culturist," published in 1867, gives a full account of it. The fruit possesses good qualities, and the plant is useful in ornamental planting, but it is not likely to reach a wide sphere of usefulness as a fruit-producing plant, unless it should be in localities where other garden fruits fail. Professor N. E. Hansen, of South Dakota, writes that he considers it of promise only where the currant does not do well. Attempts to establish it in Nebraska have thus far met with indifferent results. The fruit is abundant, but its large seed and the thorny habit of the plant are against it. Plants vary in the latter regard, and careful selection might develop forms comparatively free from thorns. The berries vary much in size, commonly being about the size of currants, though sometimes as large as small gooseberries. It commonly occurs along the borders of streams, which indicates that it may need a moist soil. It is sometimes found on loose, dry sand, but with available moisture beneath. Its early-blooming period may subject it to injury from spring frosts, hence a cool northern slope would be desirable.

Plants are propagated from suckers, cuttings or seeds. The

*Amer. Garden, 11:650.

†1873:23.

suckers are produced but sparingly, but are readily separated whenever found. From the fact that a large number of plants produced from suckers proved to be all staminate, Professor S. B. Greene was lead to infer* that perhaps the staminate plants produce more suckers than the pistillate. He still thinks that this may be true, though he writes that later observations have not enabled him to settle the point definitely. It is said to grow readily from cuttings taken in autumn and treated like grape and currant cuttings. Seeds should be planted when the fruit is ripe, or mixed with sand and planted the following spring. Fuller states† that the best way is to plant at once in rows, one or two inches deep, transplanting into nursery rows when one year old. He says that they will usually bloom the third year from seed, when the staminate and pistillate plants can be readily marked or separated.

In planting, it is important to see that both sexes are placed together; otherwise no fruit can be produced. Failure has often resulted from inattention to this detail. Professor L. C. Corbett has pointed out‡ that it is unnecessary to leave the young plants until they flower to determine their sex. He says: "There is another and easier way of distinguishing the staminate from the pistillate plants; *i. e.*, by bud characters while in a dormant condition. With care and experience one can readily separate the two." In the pistillate plants the buds are smaller, more slender, and arranged in less compact clusters.

The buffalo berry is worth planting as an ornamental shrub or small tree. Its silvery foliage is distinct and attractive, and its loads of fruit, if not taken by birds, render it a showy object throughout the closing months of the year. It appears to be perfectly hardy in the northern states when once established.

The fruit has a sprightly, agreeable flavor, which makes it pleasant to eat from the hand. It dries, but keeps indefinitely. Fruit which has laid in my desk for several years still retains its

*Bull. 18, Minn. Exp. Sta., p. 129.

†Small Fruit Culturist, 252.

‡Amer. Gardening, 1895:45.

sprightliness. Frost is said to greatly improve its quality, and it may be gathered from the bushes at any time during winter, if not previously taken by birds. It makes a very good jelly, and is said to be gathered in quantities by the Navajo Indians, who probably dry it.

The plants appear to be very productive, for they are loaded with berries, yet Dr. Hoskins reports* that with him they yield about one-fourth as much as barberries, and that the fruit is not very good. It may prove less fruitful in cultivation than in its native haunts.

THE GOUMI (Fig. 110)

ELÆAGNUS LONGIPES, Gray.

The goumi is a low, bushy shrub, with dark gray or rusty brown branches, commonly unarmed, though sometimes bearing spines. The leaves are green above, silvery beneath, and sprinkled with dark colored spots. The flowers are small, yellowish within, silvery and roughly scurfy on the outside, often dark-dotted like the lower surface of the leaves. They appear by the middle of May, and are borne at the base of short side shoots of the current season's growth. The fruit is oval, blunt, or slightly flattened at the ends, half an inch or more in length, cinnabar-red or orange colored, and covered with silvery white dots. It ripens in July, and is juicy and fine looking, but at first very astringent, leaving a disagreeable taste in the mouth. This quality disappears to some extent when the fruit is fully ripened.

The plant grows wild in eastern Asia, from Himalaya and Nepal, north to China and Japan. It appears to have been first brought to notice in England in 1873, having been exhibited before the Royal Botanical and Royal Horticultural Societies that year. William Falconer reports† that in August, 1889, Ellwanger & Barry had but a single plant of it. Reports differ as to the

*Rural New-Yorker, 1895:826.

†American Garden, 11:119.

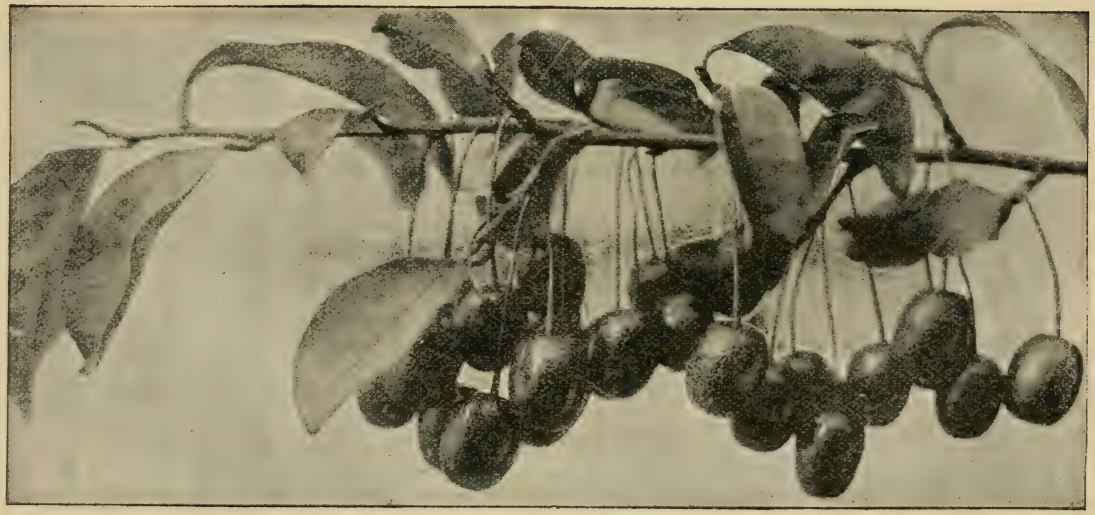

Fig. 110. The goumi, natural size.

edible quality of the fruit. William Falconer, in the note above referred to, says that it is cooked and used as a sauce with meat, especially chicken, and "it is one of the most delicious sauces that ever tickled the human palate." Others do not speak so favorably of it, saying that cooking increases its disagreeable astringent qualities. Professor Bailey says* that he enjoys eating the fruit from the bushes when fully ripe, but has not tried it for culinary purposes. It is too acid for dessert, being better adapted to uses like those of the cranberry. It is also recommended for jelly.

The plant is perfectly hardy in the eastern states, and immensely productive. Its close relation to the so-called Russian olive, *Elæagnus angustifolia*, which is a very reliable tree throughout the northwest, indicates that it may also prove hardy in that region. It is said to succeed well in California on various soils. In regard to propagation, Professor Bailey says:* "The goumi grows readily from seeds. These should be sown or stratified in summer, before they become dry, and allowed to freeze the following winter. The next spring they should germinate freely. Cuttings of the half-ripened wood strike readily in June or July, if handled in frames."

The goumi is certainly a promising ornamental plant. Its fruit is attractive while it lasts, and the foliage contrasts well with that of other plants. In nurseries the plant is sometimes known as *Elæagnus edulis*, and in various places it has received mention under the name *Elæagnus pungens*.

A closely related species, *Elæagnus umbellata*, also known under the name "Silver Thorn," has been sometimes sold for *Elæagnus longipes*, and in other cases sold under its right name. This is larger, more open and more thorny than the goumi, with lighter colored branches, and its fruit, which is smaller and possesses no value, ripens later. The plant possesses about the same ornamental qualities as *E. longipes*, but according to Dippel,† is less hardy in Germany.

*Bull. 117, Cornell Univ. Exp. Sta., p. 383.

†Handbuch der Laubholzkunde, 3:207.

HUCKLEBERRIES

The huckleberries belong to the Heath family, or Ericaceæ, which includes a great many delightful wild wood plants, such as the wintergreen, the trailing arbutus, the heather, the mountain laurel, and the rhododendrons. In spite of the beauty and attractive graces displayed by so many of these plants, they belong to a modest and retiring family. They seldom mingle among the crowds of the open country, but withdraw to the quiet, shaded nooks of moist woods and mossy swamps, or climb to bare and rocky heights, where the solitude is even more impressive. So marked is this inherent shyness that most members of the family do not take kindly to cultivation. They pine for their woodland glens or rocky crags, no matter how tender the care bestowed upon them. Hence it happens that the huckleberries, though among the finest of fruits, and among the most important in the wild state, are almost unknown in cultivation.

There are several causes which have prevented them from receiving more attention. In the first place, the fruit grows wild in abundance over large portions of the country. Added to this has been the uncertainty of success in transplanting, which with some species is considerable, and which is evidently supposed to be much greater with all than it really is. But the greatest drawback has undoubtedly been the difficulty experienced in propagating. The spread of any plant in cultivation is largely dependent upon the nurserymen, and one which they find it hard and expensive to propagate is not likely to become widely cultivated.

The wild berry fields are yearly growing less, and while many mountainous tracts are doubtless worth more as huckleberry patches than for any other purpose, unless it be to produce forests, it is evident that on most of this land the huckleberry must give place to something else as time goes on and civilization and agriculture improve. But the huckleberry is too fine a fruit to lose, and it is a source of gratification to note that there are wide-awake and far-seeing men who are learning to grow it, who are seeking to improve it by careful selection, and who are finding out its merits as a garden plant. The future of this fruit ought

to be assured, for it certainly is a promising one. Though modest and retiring, it has far more graces than most of our garden fruits, and no menacing thorns stand ready to repel the caress of its admirers.

Commercially, the huckleberry is a fruit of very considerable importance, being gathered and shipped into the city markets in large quantities. The receipts in New York city are said to exceed 2,000 bushels per day in the height of the season, while the entire quantity sold is estimated to be ten times that of any other berry.* The annual huckleberry crop of Wisconsin has been estimated at 20,000 bushels, valued at between $60,000 and $80,000.

So little has been done with this fruit that not much can be said of the soil and location best adapted to its culture, other than that the nearer the approach to the normal conditions of the species in hand, the more likely are the results to be satisfactory. With the high-bush or swamp varieties, a moist, sandy loam or mucky soil would seem to be desirable. They have been found to transplant readily when grown in deep, sandy soil. With the low blueberries, which grow upon high, rocky mountains, often with but a few inches of mould and broken stones covering the solid rock beneath, a near approach to these conditions would seem to offer the best chance of success. The high varieties, at least, seem to be benefited as much as other fruits by a dressing of well-rotted manure.

As before intimated, the difficulty of propagation is the chief hindrance to extensive cultivation of these fruits, yet with care and skill the operation becomes entirely feasible. On this point there is probably no better authority in the United States than Jackson Dawson, and we cannot do better than take his directions. He says:†

"The growing of huckleberries and blueberries from seed requires close attention, and can hardly be carried on successfully without a greenhouse or frame. The best soil to use for them is sand and loam in equal parts, care being taken that the sand is free from clay or iron. Shallow earthen pans are better

*Amer. Gar. 12 : 18, 565.

†Garden and Forest, 1:183.

for the seed than boxes, as there is less danger from fungi, but after the first transplanting boxes may be used. As soon as the fruit is received, it should be macerated in water for several days, so as to separate it from the pulp, and then washed clean. If early in the season, seeds of the early varieties may be sown at once, and will come up in a few weeks, but as the plants will make little growth, they will need careful handling to keep them over the first winter. It is better to wash out the seed and mix with fine, moist sand, and keep in a cool pit or frame until the days begin to lengthen, say about the middle of January. Then prepare the seed pans or pots and insure free drainage by using sphagnum or coarse siftings of peat. Firm the soil well and give a gentle watering with a fine hose. When the soil has settled, scatter the seeds thickly and evenly over the surface, and give the lightest possible covering. Then add a layer of fine sphagnum, syringe lightly, and set the plants in a temperature of 60° to 65°. After sowing, if the seed is not allowed to become dry, it will usually come up in from five to six weeks, although I have known it to lie in the ground a year and then germinate. The pans should be examined now and then, and as soon as the seed shows signs of germination the coarsest of the moss should be removed. When the plants have made the first rough leaf, they should be pricked off thickly in shallow boxes and fresh soil, prepared and drained as for seed. They should be syringed every day and kept growing in a high temperature and moist atmosphere. As soon as they have covered the ground they should be again transplanted. After the third pricking out, if everything has been carefully attended to, they will be growing strongly, and will need more air and less moisture, to harden them off gradually. The frequent transplanting in fresh soil each time keeps the plants from damping off and encourages good root-growth. About the first of September they can be removed to a coldframe or pit in some sheltered situation, where they should have plenty of air every pleasant day, but should be covered at night to keep them from frost as long as possible, so that they may become ripened before going into winter quarters. As winter sets in, they should be covered with moss and shutters, and will only need airing once or twice a month for a few hours to guard against fungus, which will start even in a coldframe if kept long without air. About the first of May they can be planted in prepared beds of peaty soil or a light, sandy soil of good depth. If dry weather sets in they will require a good syringing toward evening, as the plants are not deeply rooted yet, and delicate rootlets are soon destroyed if allowed to dry. After the middle of August the syringing may be discontinued, so that the plants may ripen well. When freezing weather comes, the

beds should be mulched with pine needles, oak leaves, or other similar material, to keep the plants from heaving. After the second year they are transplanted to the nursery, and need only ordinary care. When finally removed they will be found to transplant with the greatest of ease and no perceptible loss.

"The huckleberries and blueberries can also be propagated from cuttings of the underground stems or stolons which are found on many varieties. These can be taken up in the autumn, cut in lengths of two or three inches, planted in boxes of sandy peat or loam, and kept in a cool pit or house, away from severe frost, until about the 1st of February. They then require a gentle heat and moisture until they start. When they have made a good growth, they should be hardened off and treated as other hard-wood plants, but, like other members of the Heath family, they cannot endure saturation while growing under artificial treatment.

"These plants can also be grown by layers, by bending down the branches and tonguing, as with other hard-wood plants. A good moist mulch of moss around the young layers will accelerate the rooting. I have not as yet propagated them from cuttings or grafting, but I see no reason why this should not be done with cuttings of the young wood, just as other ericaceous plants are propagated."

While some satisfactory method of propagation is absolutely essential, if this fruit is ever to become widely grown or greatly improved, it is not necessary that the farmer or householder should follow these methods in order to grow huckleberries in his own garden. In many parts of the country the wild bushes are easily accessible, and may be transferred to the garden. Bushes growing in dry soil or open pastures should be selected in preference to those found in swamps. Mr. Dawson prefers small bushes, not over a foot high, and takes them up early in September. They are immediately planted thickly and firmly in a well prepared bed, in which a liberal proportion of sand and peat is mingled with loam, and protected with a heavy mulch. They remain in this bed during the following summer, being well watered when the weather is dry, and the ground kept well cultivated. Under this treatment they have an abundance of fine roots by the second spring, and can be transplanted where they are to remain with perfect ease and safety. Mr. Dawson states that he has handled thousands of them in this way with perfect success. His reason for transplanting early in September is that new roots are then

formed before winter, and if well mulched, they are ready for a strong start in spring.

Others prefer to remove the plants in spring. A. S. Fuller states* that there is no risk in moving plants from high ground with a ball of earth attached, early in spring, and that not a plant had failed out of many hundreds so handled. Joseph Meehan also reports success† in transplanting them from the woods in spring, by cutting back one-half. Nearly all the plants bore fruit the following year. Mr. Fuller was a firm friend of the huckleberry, and greatly lamented the neglect which it has suffered. In his work on small fruits, and in various other places, he urged the importance of bringing it into more common cultivation. He states that with ordinary care a plantation will last a lifetime.

Although so little known in cultivation, enough instances of success with the high-bush blueberry, *Vaccinium corymbosum*, are on record that it seems perfectly safe to recommend it. In an article in American Garden, Vol. XIII, p. 287, Jackson Dawson says: "A number of growers in Massachusetts are becoming interested in the cultivation of this plant, and are on the lookout for large varieties, so we may soon expect to see blueberries as large as cherries. Mr. Huntington, of Lynn, has now more than a dozen well-marked varieties of good size, some being one-half to three-quarters of an inch in diameter. Mr. Hervey, of Hingham, Mass., has also been growing blueberries as garden fruits for several years. He considers them a success, and would not be without them for twice their cost. Benjamin Smith, of Cambridge, secretary of the Pomological Society, has grown them a number of years, and says a few bushes give his family plenty of berries during the season. From a small row transplanted last spring, my boys gathered 8 to 10 quarts of fruit during the summer."

The following letter written to the Geneva (N. Y.) Experiment Station‡ by W. J. Scott, of Bridgewater, Oneida county, N. Y., gives another instance of success. He says: "About fifteen years ago I planted a quantity of huckleberry bushes on my farm, tak-

*Amer. Garden, 1888:186.
†Popular Gardening 6:41.
‡Ann. Rept. 1883:287.

ing them from a cold, wet swamp. My soil is dry and gravelly—good corn land. The plants were of both the high-bush and the low kind. They have borne abundantly, and we now have huckleberries by the bushel a good part of the season. The bushes grow taller and better than those in the swamp, and the berries are a great deal larger on both the high and low bushes." Attempts to grow it at the Station have proved less satisfactory. Under date of August 18, 1896, Professor S. A. Beach writes: "The heavy clay soil upon which our small fruits are grown at this Station does not appear to be at all favorably to the huckleberry, None of the plants which are mentioned in the reports of 1882–3–5 are now alive. We have made several attempts to grow this fruit from seed and from rooted plants, but so far the results have not been encouraging."

The best success in growing the low blueberries, like *Vaccinium Pennsylvanicum*, has apparently been, not with ordinary garden culture, but by transferring clumps of the plants to open pastures or a similar location, mulching, and aiming to provide them with nearly natural conditions. This is said to have been done to a limited extent in New England. As found wild, the low blueberries are much benefited by occasionally burning over the ground. The most rational system of management may therefore be a systematic burning of these wild tracts, as often as needed, with some care in aiding the plants to take full possession of the ground.

There seems to be no reason why systematic treatment of natural huckleberry land should not yield as good returns as any other horticultural operation. An interesting instance of this kind is reported from Michigan.* A farm of eighty acres, having ten or fifteen acres of huckleberry swamp on it, changed hands at a lower price than otherwise, by reason of this "waste" tract. After a vigorous campaign against berry-pickers, to establish his rights of proprietorship, the owner, in 1880, sold fruit to the amount of $700, and nearly as much in 1881. In other words, this ten or fifteen acres of land, which was supposed to be a detriment to the place, had yielded more money than all the rest of the farm. Such

* Mich. State Hort. Soc. Rept. 1881: 231.

swamps might be easily improved by supplementary planting when the stand of bushes is imperfect.

On the whole, there seems to be no reason why the huckleberry should not acquire a prominent place among the cultivated fruits of our gardens, and in its natural habitats become a source of very considerable profit. Its successful culture will doubtless be chiefly confined to the eastern half of the country, principally to the Allegheny region and Atlantic coast. The possibilities in the cooler Rocky Mountain regions, or on the moist north Pacific slopes, are unknown. So far as reported, all trials to grow the huckleberry on the Plains have resulted in failure.

The name huckleberry is applied as a generic term to cover the fruit of all species of the two genera, Gaylussacia and Vaccinium. In a restricted sense, it is used locally to designate one or more species of the former genus, the name blueberry being then applied to fruit of Vaccinium species. In other cases the term huckleberry is applied to black-fruited species of either genus. The more general custom is to apply the name huckleberry to the fruit of all.

The most important difference between these two genera is that in Gaylussacia the fruit is ten-celled, each cell containing a single seed, or properly a little stone, while in Vaccinium there are several seeds in each cell, these being small, and the fruit forming a pulpy berry. The seeds of the former, while less numerous, are far more troublesome than those of the latter. The leaves and branchlets of Gaylussacia are clammy with resinous dots when young.

Many species belonging to these two genera are known, chiefly in America, but only a few need be considered here. The following are most important as fruit-bearing plants, with possible adaptibility to garden culture.

GAYLUSSACIA FRONDOSA (L.) Torr. & Gray. Blue Tangleberry or Dangleberry.

This is a shrub growing from 3 to 5 feet high, with slender, divergent branches, which in the new growth are reddish yellow, while the older wood is covered with ashy gray bark. Its leaves are pale and glaucous or white beneath. The flowers are borne in long, loose, drooping racemes. The fruit is large, sweet,

and pleasant, with a slight acidity, dark blue with a bluish white bloom, and ripening late.

The species is found along the Atlantic coast from New England to Florida and westward to Kentucky and Louisiana. In New England it is said to occur only near the coast. By some this is considered very promising for cultivation. It grows more readily under culture than the following species, but at the Arnold Arboretum, and in that locality generally, it is said to be unproductive.*

GAYLUSSACIA RESINOSA (Ait.), Torr. & Gray. Black Huckleberry.

This is a much branched, rigid shrub, from 1 to 3 feet high. Its flowers are dull, reddish yellow, and borne in short, one-sided racemes or clusters. The fruit is sweet, crisp and firm, shiny black, without bloom. A white-fruited variety is occasionally found, and others are reported having pear-shaped berries, bluish fruit, or that which is covered with a bloom.

This species is found in open woods, on dry, rocky hills, and in swamps, from Newfoundland to Georgia, and westward to Minnesota and the Saskatchewan. It is the common black huckleberry of the market, and is well adapted to commercial purposes, owing to its firmness and consequent shipping qualities. It is more difficult to start and transplant than some of the other species, which is a serious disadvantage to the cultivator. Another objection to the fruit of this genus is found in the little, hard, sharp-edged nutlets, which give the fruit a seedy character. The smaller the fruit the more noticeable this becomes, since there are ten of these stone-like seeds in each fruit. I am told that this species is often greatly injured by insect larvæ working within the fruit, especially late in the season.

VACCINIUM PENNSYLVANICUM, Lam. Low or Dwarf Blueberry.

This is a low-growing, shrubby little plant, seldom over a foot in height, with green, angular or warty branches. The leaves are bristly serrulate, smooth and shining on both sides, and the flowers are white or pale pink. The fruit is sweet and fine flavored, commonly blue with a glaucous bloom, though forms with nearly black fruit sometimes occur.

This is the earliest of the huckleberries to ripen, and one of the finest. It is not so firm as the preceding species, but with careful handling may be carried long distances, and is extensively sold in market. It is found upon dry, rocky hillsides and mountains from New Jersey to Illinois, and northward to Newfoundland and the Saskatchewan. It has not yielded readily to the demands of cultivation. The best results have ordinarily come from simply improving its natural conditions.

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* Garden and Forest 7:328.

VACCINIUM CANADENSE, Richards. Canadian Blueberry.

This is a low shrub, 1 to 2 feet high, with light green wood, and much resembling *V. Pennsylvanicum*. Its leaves are broader, entire, and downy on both sides, the crowded branchlets being also downy. The fruit is blue-black, ripening later than that of *V. Pennsylvanicum*.

The species occurs in swamps and moist woods from Newfoundland to the mountains of Pennsylvania, and westward to Minnesota and the Rocky Mountains. It is primarily a northern species, and not common in the United States except in northern New England. From there and the Canadian provinces it is sent to the Boston market in considerable quantities after the home supply of the preceding species is exhausted.

VACCINIUM VACILLANS, Kalm. Low or Pale Blueberry.

This is a low, glabrous shrub, from 1 to 3 feet high, with yellowish green stem and branchlets. The leaves are smooth and very pale and glaucous, at least on the under side. The berries are large and sweet, generally with a blue bloom, though sometimes black, ripening from the last of July to September. The fruit is borne in clusters at the end of leafless branches of the previous season's growth, and the plants are very prolific.

The species occurs chiefly in dry and sandy soil, from New England to Michigan and Iowa, and southward to Missouri and North Carolina. Growing as it does in dry soils, being a pretty little shrub for ornamental purposes, and a prolific bearer, with fruit of fine quality, it is one of the species which would seem to be most promising for cultivation.

VACCINIUM CORYMBOSUM, Linn. Swamp Blueberry. High Huckleberry. (Fig. 111.)

A tall, handsome shrub, from 4 to 10 feet high, with yellowish green branches which turn to a light gray with age, the bark on old stems becoming rough and peeling off in shreds. The leaves are narrow, mostly egg-shaped, either smooth or downy. The flowers are large, and borne on the extremities of the previous year's growth, as in the preceding species. The fruit ripens from August to the latter part of September, and is widely variable in shape, size, color and flavor.

The species varies greatly, and several botanical varieties have been described. It grows chiefly in swamps and moist woods, though sometimes found in dry, open pastures. It has a wide distribution, occurring throughout the eastern half of North America, from Newfoundland to Louisiana. It is probably the most promising of all the huckleberries for cultivation. Experience has proved that it can be readily transplanted to garden

Fig. 111. High-bush huckleberry or blueberry. *Vaccinium corymbosum.*

soil, and will continue to thrive and fruit. Being so variable in the wild state, it offers the best of opportunities for improvement and selection. Jackson Dawson says:* "I chanced upon a bush in East Foxboro last summer which was 12 feet high, loaded with berries of a beautiful blue, rich, juicy, and half an inch in diameter, while some were even larger. In this swamp ten or twelve good forms of fruit might have been found, and by careful selection and hybridization there is no reason why the High Bush Blueberry should not become an excellent and abundant fruit, as it is more easily cultivated than any of the others." It is said not to get wormy, like the Black Huckleberry.

JUNEBERRIES

The Juneberry has received but little attention in cultivation, though not from any difficulty in growing it, as with the huckleberry. The greatest impetus to its culture came with the introduction of the variety known as Success. This was brought to notice by H. E. Van Deman, then chief of the Division of Pomology of the United States Department of Agriculture. It was found by him in Kansas,† having been brought from Illinois, where it had been grown from seeds gathered in the mountains of Pennsylvania. Mr. Van Deman gave it the name Success, and began selling plants about 1878. Some ten years later the stock was sold to J. T. Lovett, of New Jersey.

The Juneberry has often been confused with the huckleberry in parts of the West. It was grown for a number of years by Dr. James Hall, of Davenport, Iowa, who, under the name huckleberry, recommended its extensive planting as especially adapted to that region. On the strength of these recommendations many wild blueberry plants are said to have been sold throughout the state, much to the dissatisfaction of the purchasers. The true huckleberries or blueberries have never succeeded in this region, and only those who were deceived, and got the Juneberry instead, obtained any real value for their investment. On the strength of these misrepresentations, the Iowa State Horticultural Society passed resolutions of censure, cautioning all persons against buy-

*Garden and Forest, 1:184.

†Annals of Horticulture, Bailey, 1891:51.

ing or planting any blueberry or huckleberry plants.* The Massachusetts Horticultural Society awarded a silver medal to Benjamin G. Smith for introducing the dwarf Juneberry into that state,† and it is interesting to note that his plants were obtained from Davenport, Iowa, whence it was being so widely boomed as huckleberry or blueberry. The Juneberry itself thrives well throughout the West, especially the western species, *Amelanchier alnifolia.*

It is hard to prophesy regarding the future of the Juneberry, but it will probably rank much higher in the estimation of growers than at present. It thrives throughout the entire country, being especially promising upon the Plains, where many of our bush fruits do not well succeed. One point of great importance is its ability to endure late spring frosts without injury. On this point one grower says:‡ "Frosts that killed potato tops to the ground had no effect in destroying even a portion of this wonderful plant's product, even though the frost came as late as the middle of May." The fruit is mild, sweet and pleasant. It lacks character and sprightliness as a table fruit, but this defect is readily overcome by adding a few currants, cherries or gooseberries, which are available at the same season of the year. To be at its best it should be used when perfectly fresh, for it suffers much in flavor by standing. This may prevent it from becoming popular as a market berry. In fact, it ought to be primarily a home berry. It is so easily grown, and the plants themselves are so attractive that it may well find place in any home garden, however small.

One grave obstacle stands in the way of its successful culture. Every bird in the region will be there to help harvest the fruit. Only two remedies are apparent—either grow more Juneberries than the birds can hold, or plant but few, in close clumps, and protect them with netting. Benjamin G. Smith reports⁂ having been able to keep the birds away by scarecrows, which were changed in position two or three times a day. Experience with

*Trans. Iowa Hort. Soc., 1877: 203.
†Gardener's Monthly, 1878 : 306.
‡Nebr. State Hort. Soc. Rept., 1896:197.
⁂Gardener's Monthly, 1878:306.

other fruit leads to the conclusion that very lively scarecrows would be needed to interfere with the work of Nebraska birds. In Europe, cheap netting is used for protecting cherries and similar fruits, and this method could be adopted for a few clumps of Juneberries with slight expense.

The productiveness of the dwarf varieties is beyond dispute. The plants are covered with a mass of fruit until ripe enough for the birds to consider it worth their attention. In Nebraska it ripens from June 10 to July 4, in New York somewhat later. It will thrive upon any soil, as it is found from the lowest swamps to the highest mountain tops, and when once established will care for itself, if necessary, though it is, of course, benefited by good cultivation and attention. It is absolutely hardy, and a plantation will continue to thrive and bear fruit almost indefinitely.

The Juneberry is said to propagate from seeds as readily as apples. It is more commonly multiplied from the sprouts which spring up around the base of the plants. One Iowa grower recommends root-grafting it on apple seedlings.* It has been recommended as a satisfactory stock upon which to graft the pear.† It has also been reported from Illinois as a particularly suitable stock for the quince,‡ causing the fruit to mature earlier and endure the winter better.

Enemies will doubtless appear, should the Juneberry come to be generally cultivated. Already it has been noted§ that the plum curculio is frequently found among the bushes, and many of the fruits are stung by them. The berries were also found to be injured by a coleopterous larva, not determined.

The different species are so variable in the wild state that varieties would doubtless multiply rapidly were they to come into general cultivation. Already several have been named. The one named Success, previously referred to, is doubtless the most widely known, but Professor Budd refers to four forms of *Amelan-*

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*Trans. Iowa Hort. Soc., 1880:130.

†Gardener's Monthly, 1861: 229, 300 and 361.

‡Trans. Iowa Hort. Soc. 1879 :440.

§Insect Life, 3:219.

chier alnifolia,* which have been given varietal names according to the source from which they have come. "Alpina" is the name given to a dwarf form received from the mountains of Colorado; "Gardener" and "Williams" were named for the parties from whom they were received, and the name "Greene" was applied to a variety received from Greene county. He reports all of these more satisfactory in Iowa than either the eastern United States or European species.

The genus Amelanchier, to which the Juneberries belong, is closely related to the genus Pyrus, which includes the apple and pear. The species are not numerous, and all are closely related. The following are of most interest from a horticultural standpoint:

AMELANCHIER CANADENSIS (Linn.), Medic. Shad-Bush Juneberry.

This is the best known form in the eastern part of the country. It often reaches a height of forty feet, with a tall straight trunk and small spreading branches, forming a narrow, oblong, round-topped tree. It occurs from Newfoundland to Florida, west to Louisiana and eastern Nebraska, and farther northward to the Rocky Mountains. Though a desirable ornamental tree, its large size is against it as a fruit-bearing plant. Many of the trees growing wild appear to be sterile. The hills are dotted with their white bloom in early springtime, but comparatively few fruiting trees are found in summer.

A. BOTRYAPIUM (L. f.), D. C. Dwarf Juneberry. *A. Canadensis* var. *oblongifolia*, Torr. & Gray.

This is a low plant, from two to five feet high, bearing smaller flowers than the preceding species. It is found from Quebec and New Brunswick to Virginia, and west to Missouri and Minnesota, and is one of the most promising forms for cultivation. The variety known as Success belongs here.

A. OLIGOCARPA (Michx.), Roem. Northern Dwarf Juneberry.

This is another dwarf form, two to four feet high, found in cold swamps and mountain bogs from New York and Northern New England northward to Labrador and Newfoundland. It is highly recommended as an ornamental plant and the fruit is said to be large, dark blue-purple, with a heavy bloom, often nearly

*Popular Gardening, 6:2.

Fig. 112. *Amelanchier alnifolia.*

twice as long as broad, sweet, with a more decided flavor than that of the other Juneberries.

A. ALNIFOLIA, Nutt. Western Service Berry or Shad Bush. (Fig. 112.)

This is a low shrub, usually only a few feet high, though rarely becoming a slender tree. The leaves are broad, oval or

nearly circular in outline, and the fruit ripens from June to September, according to location. It is dark blue, or sometimes nearly black, covered with a glaucous bloom, very sweet and juicy, and is said to reach from half an inch to nearly an inch in diameter. The species is widely distributed over the western half of the continent, extending eastward as far as the western shores of Lake Superior and the northern peninsula of Michigan. It is one of the most promising species as a fruit-producing plant. Its great productiveness and the large size and good quality of its fruit are likely to place it in the lead for the western half of the country, at least.

THE TREE CRANBERRY (Fig. 113)

The so-called tree cranberry or cranberry-tree is not a cranberry in any sense of the word. It has received this name owing to a superficial resemblance of its fruit to that of the cranberry. Though round and red like the cranberry, in structure and flavor it is entirely different. The plant belongs to the Honeysuckle family, the species being *Viburnum opulus*, Linn. It is a tall and nearly smooth shrub, with gray bark, scaly buds and large, three to five-lobed leaves, the lobes pointed and commonly few-toothed. The flowers are white, borne in broad, flat clusters, and are followed by the bright-colored fruit which is carried on the tips of the branches, well above the leaves. The species is much better known in the modified form in which it commonly appears in cultivation, which is the guelder rose or snowball tree so frequently planted upon lawns. In that form it has become entirely sterile, by the culture adopted to bring out the spherical head of bloom. In the wild type only the marginal florets are neutral.

The species is found wild in the northern parts of Europe, Asia and North America, and is in many respects a more desirable ornamental plant than its modified descendant. Although pleasing in habit and foliage, it is especially attractive in fruit. About the last of July the berries take on a greenish yellow or orange hue, tinged with bright red on the side toward the sun. From that time until spring, unless taken by the birds, which commonly do not molest it when other food is abundant, the fruit is always attractive. When ripe in autumn it becomes a brilliant

Fig. 113. Tree Cranberry, *Viburnum opulus*.

deep scarlet and remains so until severe frosts, which cause it to become somewhat duller, though it will remain conspicuously bright all winter if allowed to hang. This renders the plant attractive throughout the greater portion of the year. Its flowers, too, are as graceful as those of the sterile form.

The plant deserves all the praise it is likely to receive as an ornamental, but as a fruit-producing plant it is of doubtful value. The fruit is said to be very sour, but more agreeable than the true cranberry. It is used to some extent as a substitute for it, and makes good sauce or jelly, though too astringent to suit some

palates. A very serious objection appears in the large size of its seeds, though different plants vary somewhat in this respect. Were it not for this defect it might become a fruit-producing plant of considerable importance. Its name, tree cranberry, is a standing temptation to smooth-tongued agents to recommend the plant as a satisfactory substitute for the cranberry, suited to upland soils and regions in which the cranberry does not succeed. In such cases it must prove a disappointment, though deserving the highest praise for the purposes to which it is adapted. The plant is perfectly hardy, so far as cold is concerned, and can be grown in almost any soil or location. It may be propagated by layers, by hard-wood cuttings, or by seeds, though the latter require two years for germination.

THE BARBERRY

Unlike many of the fruits which we have been considering, the barberry has once been popular and has since declined in favor. It may, therefore, be appropriate to substitute for a modern description of the plant that given by Gerarde in 1597. He says: "The barberry plant is an high shrub or bush, having many young straight shoots and branches very full of white prickly thorns, the rind whereof is smooth and thin, the wood itself yellow: the leaves are long, very greene, sleightly nicked about the edges, and of a soure taste: the flours be yellow, standing in clusters upon long stems: in their places come up long berries, slender, red when they be ripe, with a little hard kernell or stone within, of a soure and sharp taste: the root is yellow, disperseth it self far abroad, and is of a wooddy substance. Wee have in our London gardens another sort, whose fruit is like in forme and substance, but one berry is as big as three of the common kinde, wherein consisteth the difference. We have likewise another without any stone, the fruit is like the rest of the Barberries both in substance and taste."

In regard to its distribution, Gerarde says: "The barberry bush grows of it selfe in untoiled places and desart grounds, in woods and the borders of fields, especially about a gentlemans

house called Mr. Monke, at a village called Iver two miles from Colebrooke, where most of the hedges are nothing else but Barberry bushes. They are planted in most of our English gardens."

Among "The Vertues" ascribed to the plant, the following are of special interest. "The leaves are used of divers to season meat with, and instead of a sallad, as be those of Sorrell." After enumerating various medicinal "vertues" he adds: "A conserve made of the fruit and sugar performeth all those things before remembered, & with better force and successe."

Philips, writing in 1822,* quotes from another author as follows: "Barberries are of an agreeable, cooling, astringent taste, which creates appetite." He further says: "Pickled barberries make a handsome garnish for all white dishes, where acids can be introduced: this fruit is also used for making syrup, lozenges, &c. We have now several varieties of barberry-shrub cultivated in England, one of which was brought from Candia in 1759, and another from Siberia in 1790, but it possesses no advantage over our native kind of this fruit."

This common barberry of Europe, *Berberis vulgaris*, has become naturalized in New England, and is more or less widely planted elsewhere. Downing gives it a brief notice† and Fuller‡ enters into a somewhat extended discussion of it, mentioning a number of species and varieties.

It is chiefly planted for ornament, rather than fruit, and for this purpose another species, *B. Thunbergii*, or purple-leaved barberry, which has inferior fruit, is generally preferred.

Downing says that "The barberry is too acid to eat, but it makes an agreeable preserve and jelly, and an ornamental pickle for garnishing some dishes." It comes into use later than the currant and probably fills about the same place that the buffalo berry might, were that more generally cultivated. Dr. Hoskins, of Vermont, who has both growing, reports it far more productive than the buffalo berry. He writes that although his plants were set on the lawn for ornament, a good market has been found for

* Pomarium Britanicum, p. 62.

† Fruits and Fruit Trees of Amer., p. 442.

‡ Small-Fruit Culturist, p. 20.

the fruit, and he thinks it would pay to plant them on a larger scale.

Plants may be propagated by seeds, which should be sown or stratified in the fall, or by separating the suckers which spring up about the main stem. They may also be grown from cuttings of one or two-year-old wood, taken in the fall, or treated like currant and gooseberry cuttings, though they do not root so readily as these plants.

The merits of the barberry as an ornamental plant need not be further discussed, but as a fruit-producing plant it may teach a lesson. We talk much of the improvement of wild fruits, and are almost led to believe that we can take anything that is edible, no matter how small, hard, sour, puckery or thorny it may be, and by careful selection and hybridizing, produce from it a fruit which shall delight the taste and swell the purse of coming generations. Does not the history of this fruit suggest that, after all, there may be some things which are not worth trying to improve?

THE SAND CHERRY

I cannot bring myself to close this discussion of miscellaneous bush fruits without a brief mention of the western sand cherry, although its relationships might more naturally classify it among the stone fruits. This plant is known botanically as *Prunus Besseyi*, Bailey.* It is a graceful, somewhat spreading shrub, 3 to 4 feet high, with slender, ascending or slightly drooping branches. At flowering time the leaves are small, narrowly oblanceolate, and slightly whitened beneath, but at maturity they become oval or elliptic, very bright and shining on both sides. The flowers are borne in axillary clusters all along the younger branches, so that at blossoming time these are one mass of bloom. The fruit ranges from three-eighths to five-eighths of an inch in diameter, and is usually very dark purple or blackish in color. In flavor it resembles the improved forms of the east-

*For a fuller account of the species, see Cornell University Experiment Station Bulletin, 38 : 58-65, and 70 : 260-262.

ern choke cherry, *Prunus Virginiana*, occasionally found in cultivation, but is larger.

The species is found wild from Manitoba to Kansas and westward to the mountains of Colorado and Utah. Its value as a fruit-plant has been urged from time to time, and it was introduced from Colorado as the improved dwarf Rocky Mountain cherry. Plants received under this name have been growing in the grounds of the Nebraska Experiment Station for several years, and although white with blossoms in springtime, none of the fruit matured until wild plants were set in the same garden, probably owing to a lack of proper fecundation.

Similar lack of fruitfulness sometimes occurs when wild plants are removed to the garden, though as a rule they are immensely productive. Wild plants set in the spring of 1895 were loaded with fruit in 1897. The size varies much on different plants, showing abundant opportunity for selection. It ripens after other cherries, from the middle to the last of July, in Nebraska. The largest fruits are about equal in size to the Early Richmond and English Morello, as grown here. Although somewhat astringent, it is rather pleasant to eat out of hand, and rapidly disappeared from our plants, which are near to the farm buildings. It should be left until fully ripe, for this astringency is then less noticeable. Any eastern housewife who has known the value of the better forms of the eastern choke cherry, though such are few, for that species is little known in cultivation, will be able to appreciate the merits of the sand cherry as a fruit. Many western housewives know it already. It makes excellent sauce and admirable jelly, and is, no doubt, equally good for pies.

Those familiar with the cultivated choke cherry find that when its fruits are fully ripe their astringency may be almost wholly removed by rolling them in a sack or shaking them in a closed dish. When so treated they make an excellent dish, eaten raw with sugar and cream. Perhaps a similar treatment might improve the sand cherry.

Whatever value the sand cherry may have as a fruit-producing plant in the future pomology of the country, its position as an ornamental shrub is assured, and it is chiefly to this use that I

wish to call attention in the present notice. I know of no shrub more useful for ornamental planting on the Plains than this. It is perfectly hardy and adapted to the region, and is a rapid and vigorous grower.

As a low-growing shrub, or as a foreground for larger groups, it can hardly be surpassed. In the plantings on the campus of the University of Nebraska, it has been used more extensively than anything else.

None of the broad-leaved evergreens, such as rhododendrons, mahonias and kalmias, succeed in the dry and trying climate of the Plains, but this plant is a very satisfactory substitute during more than half the year. It is one of the first to awaken in spring and one of the last to hold its leaves in the fall, being unharmed by the first frosts, which ruin the effect of many ornamental shrubs. Its bright, clean, glossy foliage closely approaches that of the broad-leaved evergreens in effect. It has also the very desirable quality of presenting beautiful autumn tints, as a parting picture to be held in remembrance during the dreary days of winter, a quality all too rare among the plants of the Plains, but one which is fully appreciated by all who recall the flaming hillsides of an eastern October day.

APPENDIX

AMERICAN BOOKS ON BUSH-FRUITS

There are no American books devoted to bush-fruits alone, except the present volume. There are a few books on small-fruits in general, however, and these are recorded below. Books devoted wholly to the strawberry or the cranberry are omitted. The general fruit manuals contain chapters on the various bush-fruits, and a list of these books may be found in "Principles of Fruit-Growing." Much historical information will be found in "Evolution of Our Native Fruits." The following are the books in the editor's library which give special attention to bush-fruits:

ABBOTT, FRANCIS B.

HAND-BOOK OF SMALL FRUITS. Illustrated. Chicago. n. d. [n. c.] Pub. by the author, in the eighties. pp. 36. 5¾ x 3½.*

BIGGLE, JACOB.

BIGGLE BERRY BOOK; a condensed treatise on the culture of berries. With leaves from the experience of many practical berry-growers in all parts of the United States. Illustrated. Philadelphia, 1894. [c. 1894.] Wilmer Atkinson Co. pp. 126.

FULLER, ANDREW S.

THE SMALL-FRUIT CULTURIST. Beautifully illustrated. New York. n. d. [c. 1867.] Orange Judd Co. pp. iv+276. 7½ x 5.—[Translated into Germen by Heinrich Maurer as A. S. Fuller's Kultur der Fruchtsträucher, als der Erdbeeren, Himbeeren, Brombeeren, Johannisbeeren, Stachelbeeren, Kornelkirschen, Preiszelbeeren, Heidelbeeren, Berberitzen, Zwergkirschen, etc., etc. Nebst einer Anleitung zum Eidsammeln, zur verpackung und versendung der Früchte. Mit. 27 Tafeln, enthaltend 103 Abbildungen. Weimar. 1868. [n. c.] Voigt. pp. ix+142+27 plates. 8¼ x 5¾.

—Same, new, rewritten, and enlarged edition. 1881. [c. 1881.] pp. 287. 7½ x 5.

—Same, third ed. 1897. [c. 1887.] pp. 298.

*Size of book, in inches.

GALUSHA, O. B.

Luscious Fruits; How to grow Strawberries, Raspberries, Blackberries, Grapes, Currants and Gooseberries in abundance and economically, on a small scale. Farm Library, Vol. I, No. 5. Mar. 1, 1882. Chicago. [c. 1882.] Pub. by E. H. Libby. pp. 24. 7½ x 4½.

GREEN, CHARLES A., ED.

Green's Fruit-Grower; special issue of, devoted to Strawberry culture, Grape culture, Apple and Pear culture, Plum and Cherry culture, Raspberry and Blackberry culture. Illustrated. Rochester, July and October, 1886; April, July and October, 1887. [c. 1888.] pp. 81. 9½ x 6. [Five issues under one cover.]

GREEN, C. A.

Green's Six Books, devoted to Apple culture, Pear culture, Plum and Cherry culture, Raspberry and Blackberry culture, Grape culture, Strawberry, Currant, Gooseberry and Persimmon culture. Illustrated. Rochester, N. Y., 1896. [c. 1894.] Green's Nursery Co., N. Y. pp. 142. 9 x 6. [New edition of 1896.]

HILLS, WILLIAM H.

Small Fruits; their propagation and cultivation, including the Grape. Containing practical directions for the selection of soil and its preparation; the use of manures and fertilizers; crossing, hybridizing, and growing new varieties from seed; transplanting, pruning, and training; gathering, packing and marketiug fruit; descriptions of varieties, their origin, diseases, and insect enemies. Illustrated with numerous engravings. Boston. 1886. [c. 1886.] Cupples, Upham & Co. pp. 138. 9 x 6.

PARDEE, R. G.

A Complete Manual for the Cultivation of the Strawberry; with a description of the best varieties. Also, notices of the Raspberry, Blackberry, Cranberry, Currant, Gooseberry, and Grape. With directions for their cultivation, and the selection of the best varieties. With a valuable appendix, containing the obser vations and experience of some of the most successful cultivators of these fruits in our country. New York. 1854. [c. 1854.] C. M. Saxton. pp. viii+144. 7½ x 5. B.

—Same. Third revised edition. Illustrated. New York. 1856. [c. 1856.] C. M. Saxton & Co. pp. vi+157. 7½ x 5.

—Same. Sixth edition. New York. 1858. [c. 1856.] A. O. Moore. pp. xii+157. 7½ x 5.

—Same. New and revised edition. New York. n. d. [c. 1856.] Orange Judd & Co. pp. xii+157. 7½ x 5. [Contains a "preface to the tenth edition," dated January, 1865.]

PARRY, WILLIAM.

Fifty Years Among Small Fruits. Telling what and how to plant. Illustrated. Parry, N. J. n. d. [1885.] Pub. by the author pp. 64. 9 x 6.

PURDY, A. M.

SMALL-FRUIT INSTRUCTOR. New edition. Illustrated. Palmyra, N. Y. 1887. [c. 1887]. Pub. by the author. pp. 128. 9 x 5¾.

ROE, EDWARD P.

SUCCESS WITH SMALL FRUITS. Illustrated. New York. 1880. [c. 1880.] Dodd, Mead & Co. pp. 313. 9½ x 7¼. [The Illustrated quarto edition.]

—Same. 1886. [c. 1881.] pp. xvi+319. 9 x 6½. [The illustrated quarto edition, with narrower margins. Has a "preface to the new edition," dated 1886.]

—Same. n. d. [c. 1881.] pp. 388. 7½ x 5¼. [New edition; preface dated 1886.]

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